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MAY, 1939

FACTORY

MANAGEMENT and MAINTENANCE

A McGRAW-HILL PUBLICATION

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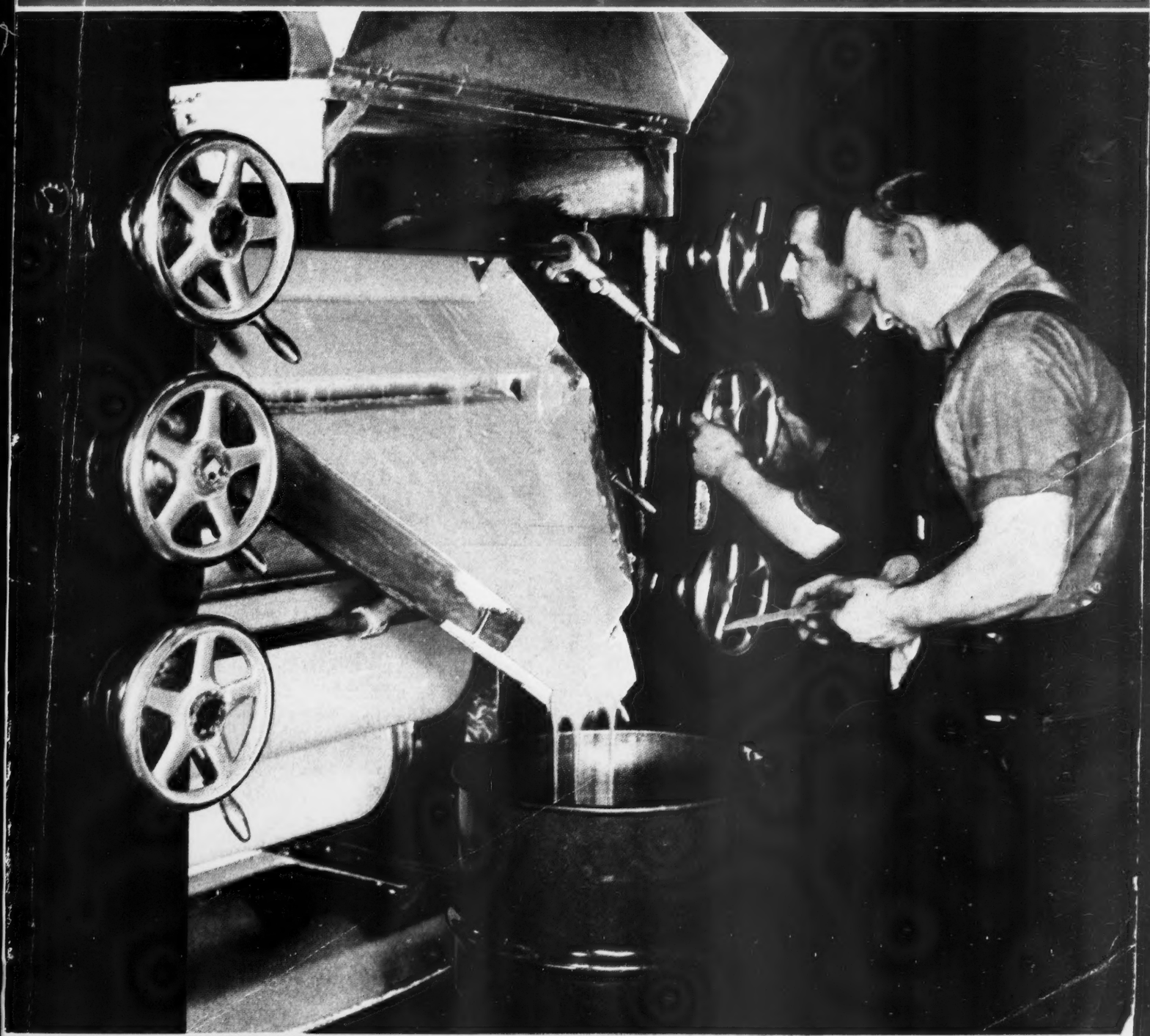

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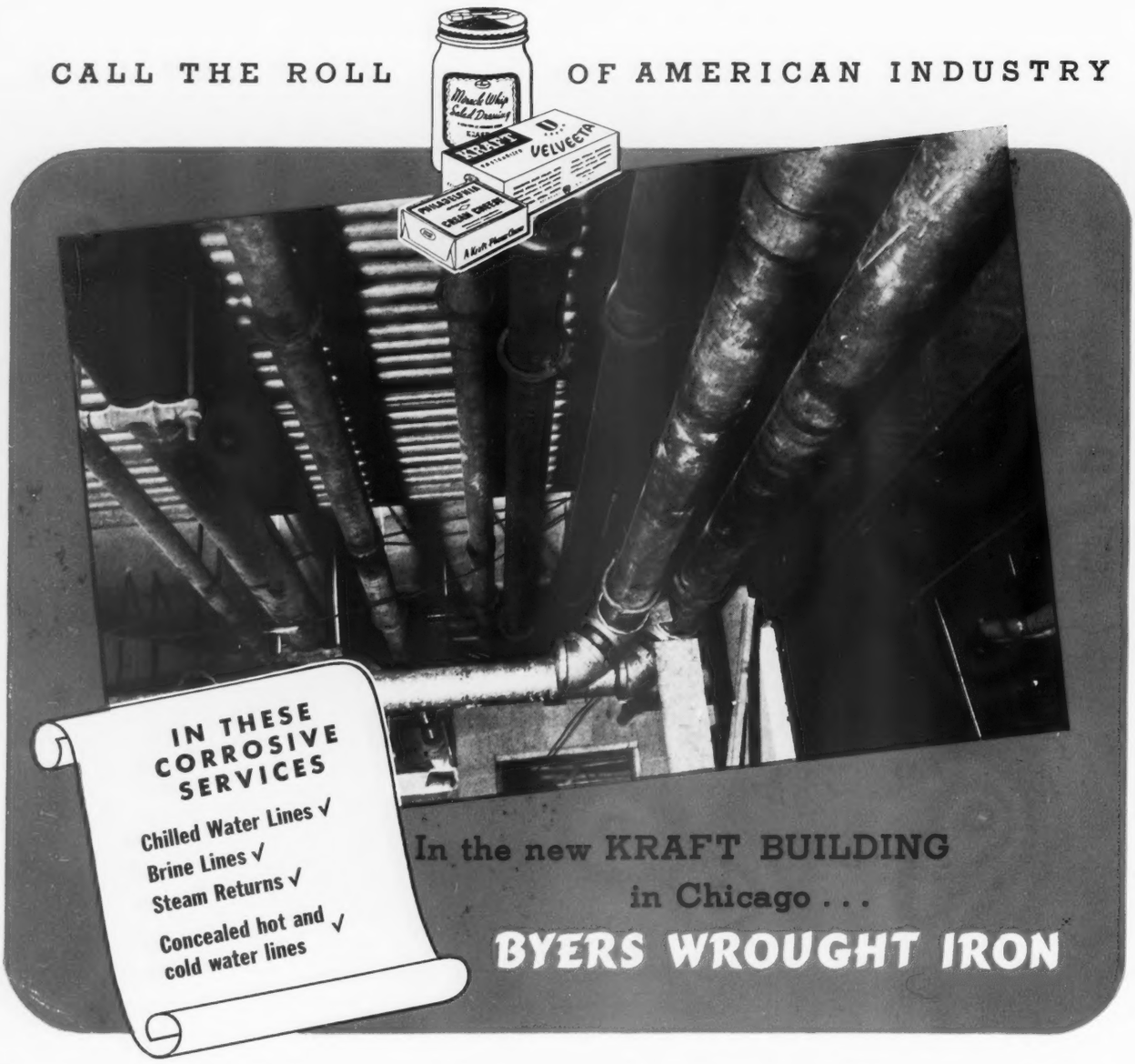
DR. VICTOR G. HEISER — INDUSTRY'S HEALTH PROBLEMS

CALL THE ROLL OF AMERICAN INDUSTRY



IN THESE CORROSIVE SERVICES

- Chilled Water Lines √
- Brine Lines √
- Steam Returns √
- Concealed hot and cold water lines √

In the new KRAFT BUILDING in Chicago . . .

BYERS WROUGHT IRON

Every Thursday evening finds the Kraft Music Hall bringing star entertainment to millions of living rooms. *Any* evening finds Kraft Cheeses and Salad Products bringing new taste delights to countless dinner tables.

The market created by these exceptional products and their exceptional merchandising must be dependably served. In the new Kraft-Phenix Chicago plant, the corrosive services listed above were specified "wrought iron"—the practice of leading firms throughout the country.

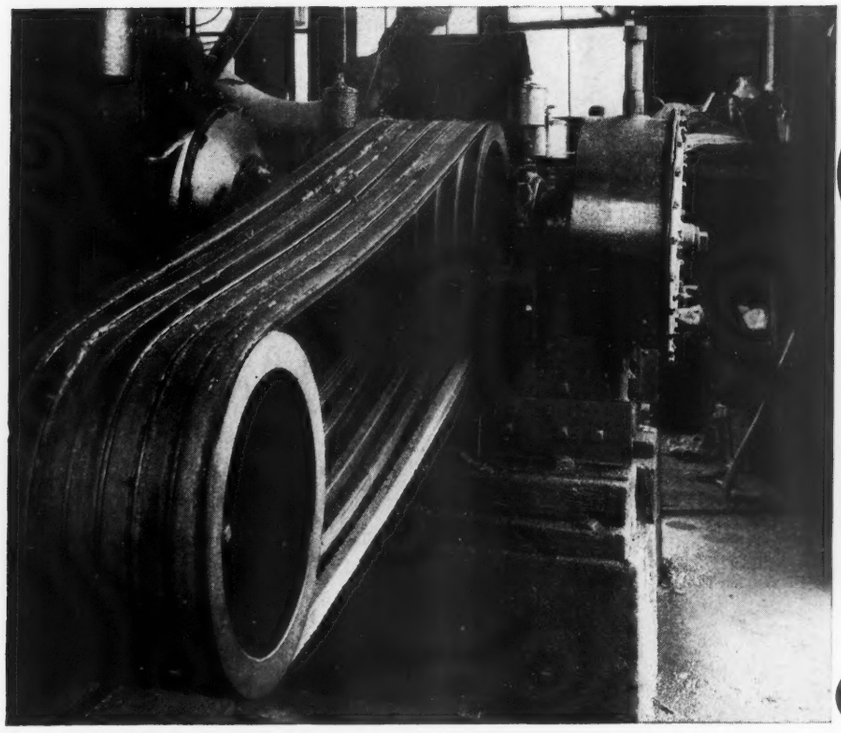
Corrosion costs you more than wrought iron . . . tell us your problem, and we'll tell you why. If you will write concerning your specific corrosion difficulties, our Engineering Service Department will determine the probable corrosive conditions . . . relate these to similar conditions recorded in our data files . . . interpret the results, applying engineering judgment gained in 75 years' contact with corrosion problems . . . and make recommendations backed by actual performance data. Ask, too, for a copy of the bulletin, "Wrought Iron in Refrigeration and Air Conditioning Systems."

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

BYERS GENUINE WROUGHT IRON

TUBULAR AND FLAT ROLLED PRODUCTS

SPECIFY BYERS GENUINE WROUGHT IRON PIPE FOR CORROSIVE SERVICES AND BYERS STEEL PIPE FOR YOUR OTHER REQUIREMENTS



Recent improvements in Goodrich V belts

1. New designs of low-stretch cords every foot made to Goodrich specifications.
2. Improved cover compounds for resistance to light, air, oil.
3. Cool-flexing rubber — outlasts rubber of far higher tensile strength.
4. Matched sets — belts of same length measured *while actually running under full load.* Special machine to do this invented by Goodrich research men.

7 belts grew whiskers

-- but saved money, trouble, hours of time

Let modern cool-running Goodrich V belts make your work easier, your machines more efficient

YOU GAIN valuable time, your firm saves money, when modern, improved Goodrich V belts go on a drive. These tension-matched sets of cool-running low-stretch power-carriers are as different from old belts as your new machines are different from the ancient ones. You'll know you won't be taking time out for adjustments, replacements, take-ups; wondering why one belt stays tight while others are loose, why some wear out, others keep going.

When belts grow whiskers

(Top photo). Here's just one of the long economy records of Goodrich V belts.

Here's how belts are measured under load. Belt users are invited to inspect this unique machine in visits to the Goodrich plant.

MR. BELL, WHY DO SOME BELTS IN A SET GET LOOSE WHILE OTHERS ARE TIGHT
AFRAID THEY AREN'T MATCHED VERY WELL, JIM. NEXT TIME WE'LL GET GOODRICH TENSION-MATCHED SETS

These seven belts still going strong after 8 YEARS on a dredge of a large cement-products company (name on request). Often in contact with oil, protected by 2-ply fabric cover that finally frays, gets "whiskered" edges — but belts have gone on running. Even eight years ago Goodrich made rugged, long-lived belts.

New improvements every year

In these 8 years there have been at least two dozen successive improvements in Goodrich V belts. Under test conditions new 1939 Goodrich belts last *six times as long* as 1931 belts. Most important reasons are:

Run cooler: Goodrich developed cool-flexing rubber. Naturally any working part lasts longer at lower temperature. Cords keep their strength; rubber keeps its flexibility.

Tension-matching: Now belts work together as a team. Measuring in relaxed condition wasn't enough. Goodrich measures while running under operating tension. Now each belt carries its share of the load, no belt sags or gets limp.

Less stretch: Goodrich belt men have made repeated improvements in cord design to add strength, reduce stretch. Less stretch means less slipping; less slipping means less wear.

Long aging: Goodrich has made at least a dozen repeated improvements in rubber compounds to make them last longer, resist air, light, oil. Only experts in rubber can make these continuous improvements. Judge their value by performance of these new Goodrich belts.

Write about this today

Write today to Goodrich or nearest Goodrich distributor. Just say, "Will be glad to have you tell me MORE about a V belt that will save money for our company and time for our men." Goodrich representatives know V belts and belt problems. No obligation of course. The B. F. Goodrich Company, Akron, Ohio.

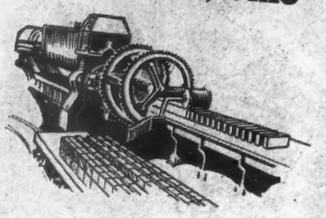
Goodrich

cool-running, tension-matched

V belts

SILENT CHAIN PERFORMANCE FACTS

CASE HISTORY
Four Link-Belt
Silent Chain Drives
Purchased 1919
Camp Bros.
(Brick Mfrs.)
Mogadore, Ohio



MAINTENANCE COST ONLY 2⅓c PER YEAR PER H.P.

This 19 year record proves the outstanding economy of Silverstreak Silent Chain Drives

● The above performance data secured from the Camp Bros. brick plant at Mogadore, Ohio, is definite evidence that Silverstreak silent chain drives provide outstanding operating economy. At this plant four Link-Belt Silverstreak silent chain drives, totalling 500 H.P., have been operating efficiently since 1919—and the total maintenance cost in all that time has been only $219.39.

The reason for such performance is simply this: Silverstreak silent chain drives are designed and built to give extra service. They are positive in action—no slip—less wear—and every R.P.M. of the motor is faithfully delivered and they require practically no attention. Smooth, trouble-free operation is assured over a long period.

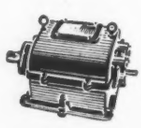
The low first cost of Silverstreak silent chain drives will probably surprise you. Get the facts now—ask for Engineering Data Book No. 125. Also for special books covering all or any of the complete line of Link-Belt positive drives illustrated below.

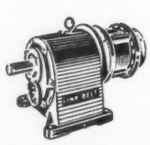
Link-Belt Company, Indianapolis, Chicago, Philadelphia, Atlanta, San Francisco, Toronto. Branch offies and distributors in all principal cities. 7657

ROLLER CHAIN DRIVE

P.I.V. GEAR SPEED VARIATOR

V.R.D. VARIABLE ROLLER DRIVE


HERRINGBONE GEAR REDUCER

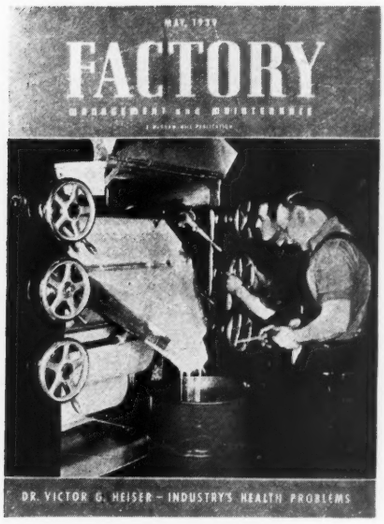

MOTORIZED REDUCER

WORM GEAR REDUCER

1939
NEW YORK WORLD'S FAIR EXHIBITOR METALS BLDG.

LINK-BELT

SILVERSTREAK SILENT CHAIN DRIVES



ONE OF THE OLDEST WAYS to grind paint is between two stones. It is still a good method. But in mass production it has been largely replaced by modern roller mills. For instance, the mill on this month's cover is a five-roll affair, one of a battery in action at Sherwin-Williams's Newark (N. J.) plant. It is this use of the newest and best equipment that enables modern industry to turn out better products at prices more and more people can afford to pay. Full-color photograph by McGraw-Hill.

•

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FACTORY

MANAGEMENT and MAINTENANCE

MAY, 1939

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RESEARCH IN LUBRICATION

has created an extra margin of safety in GULF PRODUCTS

This experimental equipment — designed and built in the Gulf Research Laboratory — is used to test bearing lubricants under a wider range of operating conditions than are encountered in actual service. Thus Gulf's field engineers are able to recommend lubricants for specific applications which not only meet the prevailing conditions, but provide an *extra margin of operating safety.*

GULF TECHNOLOGISTS *test bearing oils under load and temperature conditions far more severe than are encountered in actual service.*

WHAT changes take place in an oil under severe service? What is its rate of oxidation? What is the safest oil to use for a particular type of bearing? Answers to these and many other questions regarding lubricants are being accurately determined each day in Gulf's modern research laboratory.

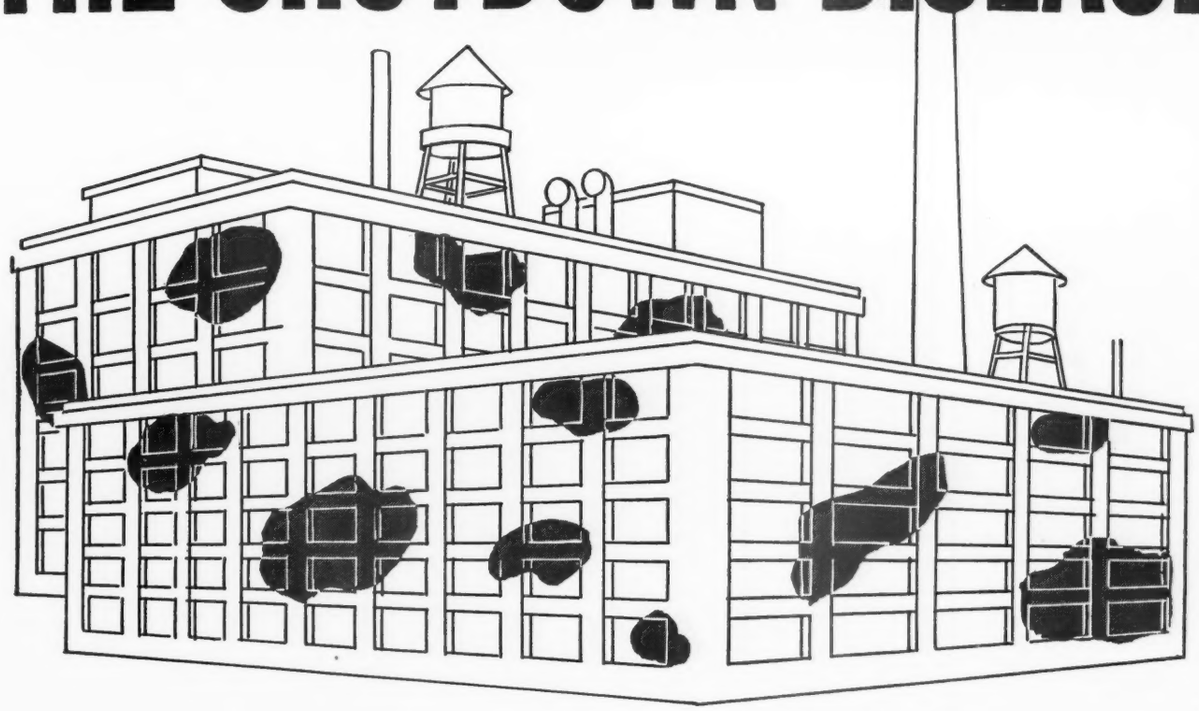
Special machines, designed and built expressly for this experimental work, not only duplicate the conditions under which oils must perform in service, but set up still more severe conditions in order to insure an extra margin of operating safety for the lubricant under test. Thus, the knowledge gained by many years of practical experience in lubricating machinery of all types can be supplemented with newly developed facts.

There is a Gulf quality lubricant which will insure minimum wear and long life for every bearing and moving part in your plant. Ask the Gulf engineer who calls on you to recommend the oils and greases best suited to your needs. They are quickly available to you through more than 1100 Gulf warehouses in 28 states . . . Gulf Oil Corporation—Gulf Refining Company, Pittsburgh, Pennsylvania.

GULF INDUSTRIAL LUBRICATION

Also A COMPLETE LINE OF FUEL AND FURNACE OILS

THE SHUTDOWN DISEASE



can attack any factory!

Your factory may be suffering from the *Shutdown Disease* without your realizing it.

Chronic shutdowns are not usually spectacular. A motor here . . . a few machines there. *But the costs add up.*

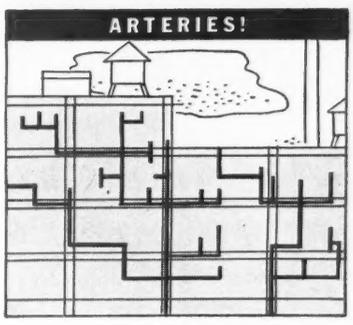
In too many factories, shutdowns come to be taken as a matter of course. They are forgotten too soon . . . and happen again too often. In the course of a year their *total* cost can cut sharply into profits.

Yet, like many other diseases, the *Shutdown Disease* can be cured and prevented.

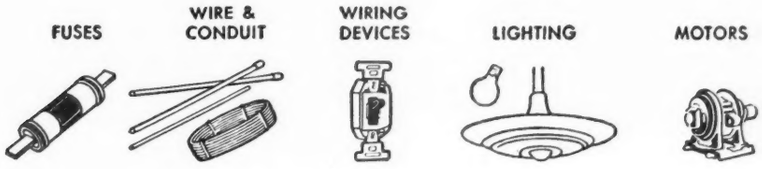
If the shutdown is an electrical one, there is a quick and easy *cure.* Call your Electrical Contractor or if you do your own installing call your nearby Graybar warehouse. You'll find it well-stocked with all the electrical items you are likely to need. Graybar trucks are ready to deliver the needed items . . . quickly . . . conveniently.

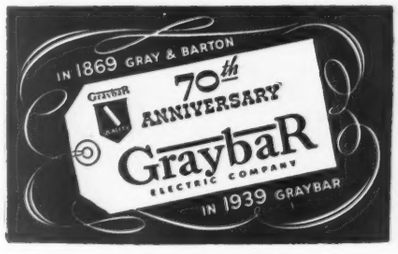
At the same time Graybar can help you *prevent* shutdowns...by providing the kind of reliable products that stand up on the job year after year.

Graybar's service of supplies is *keyed* to your needs . . . to save you money. Investigate! Ask a Graybar salesman—or write to the Graybar Electric Company, 420 Lexington Ave., New York, N. Y.

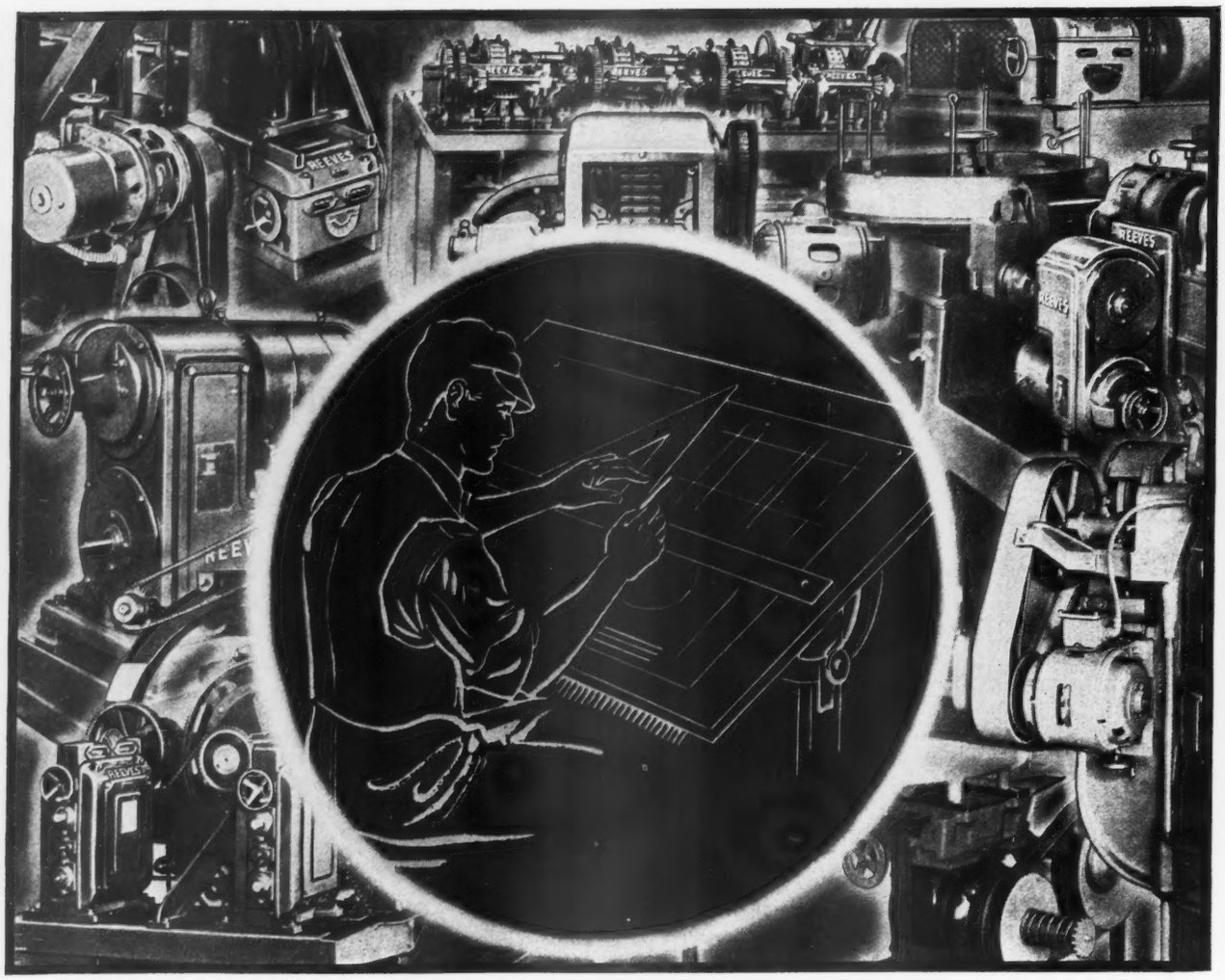


The wires that run through the raceways under your floors or through the walls are the *arteries* that keep your plant alive. Their failure results in Shutdowns. Be sure they are right to take care of today's needs. A survey of wiring costs nothing—saves much.





OFFICES IN 83 PRINCIPAL CITIES • EXECUTIVE OFFICES: GRAYBAR BUILDING, NEW YORK, N. Y.



BUILDERS OF 1325 DIFFERENT MAKES OF MACHINES CAN'T BE WRONG . . .

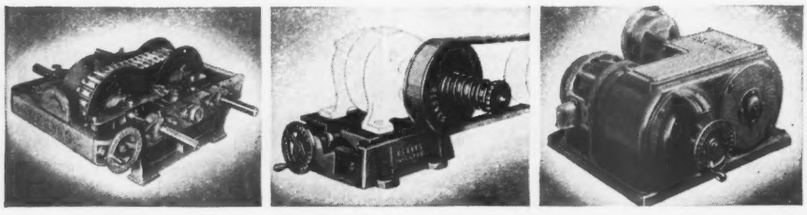
When you find builders of 1325 different kinds of machines—used in every industry—adopting a given make of speed control equipment, you can't go wrong on that equipment for your own needs.

REEVES units—Transmission, Vari-Speed Motor Pulley and Motodrive—are the only speed control equipment in the world with such an overwhelming endorsement. Builders of these hundreds of machines have standardized on REEVES to give the speed flexibility which their customers demand to insure maximum productive efficiency under every changing operating condition.

Chances are that many new machines which you buy today come REEVES-equipped. Of course, REEVES Speed Control can be applied easily and quickly to machines now in use which do not yet have the many advantages of full speed adjustability.

Let our engineers show you how it can be done. You are probably in or near one of the 33 industrial centers of the U. S. and Canada where REEVES engineering service is quickly available. Write today for the name and address of your nearest REEVES representative and for our new catalog G-384, describing the complete REEVES line.

REEVES PULLEY COMPANY, Dept. F19, Columbus, Indiana.



THE 3 BASIC UNITS IN MODERN REEVES LINE

REEVES
• accurate
• positive
SPEED CONTROL

HANDS *Control* BRUSHES

Brushes CONTROL COSTS

● *Do you pay good wages to good workers and then handicap them with poor brushes?*

Brushes are *tools*. Why not consider them as such? When a file wears out, you discard it. You know that a worn file wastes many times its replacement cost by slowing up the user and reducing his efficiency. The same principle applies to brushes.

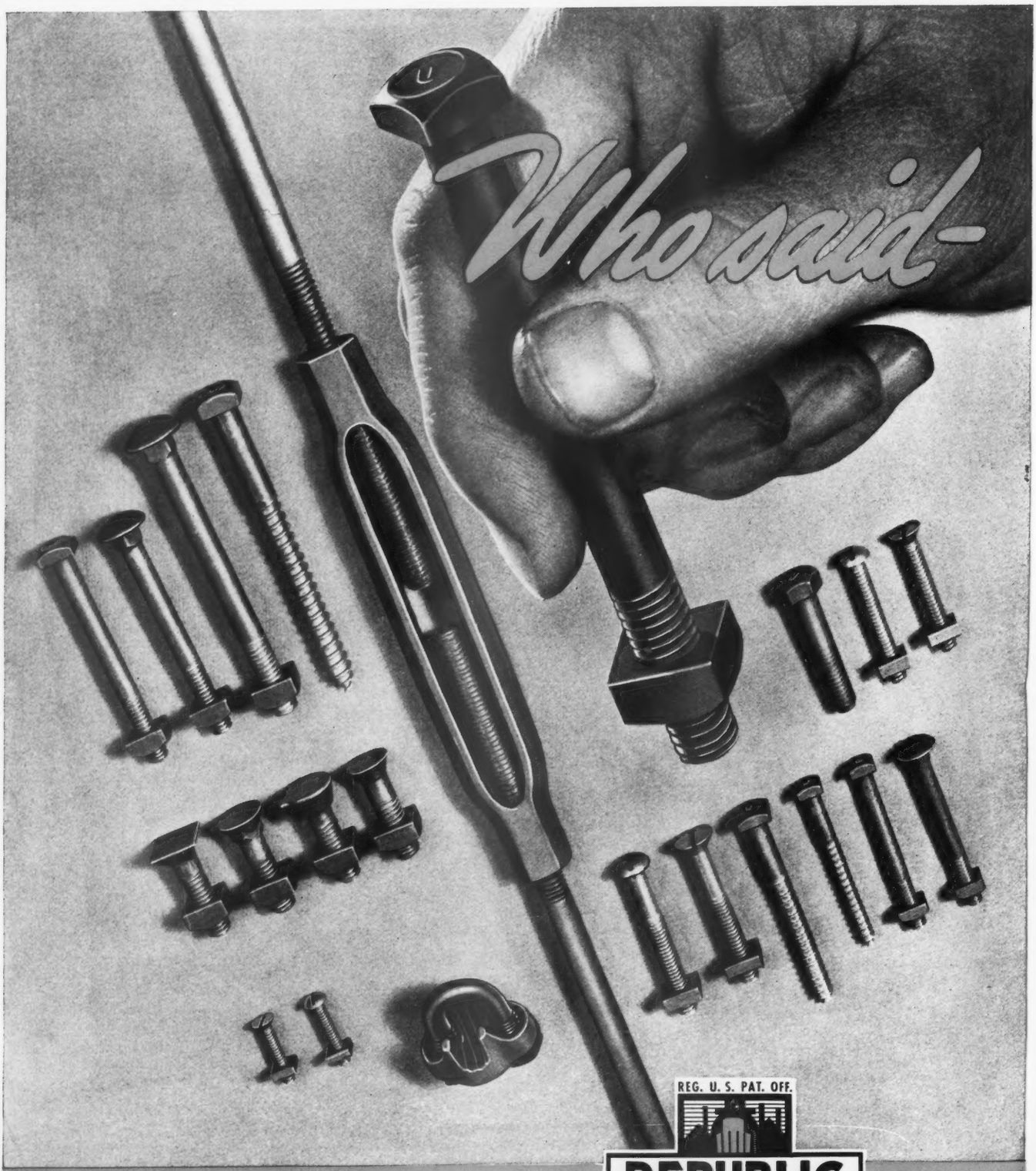
Be sure that every production and maintenance brush in YOUR plant is in good working condition and correctly matched to job requirements.

Osborn and the Osborn Distributor in your locality can help. *Ask about it!*

THE OSBORN MANUFACTURING COMPANY
5401 HAMILTON AVENUE • CLEVELAND, OHIO
Sales Offices: New York • Detroit • Chicago • San Francisco

OSBORN Osborn Brushes

PROTECT THOSE HOURS SPENT WITH BRUSHES



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REPUBLIC STEEL

A FEW OF THE MANY REPUBLIC STEEL PRODUCTS

Alloy and Carbon Steels • ENDURO Stainless Steel • Republic Double Strength Steel • Toncan Copper Molybdenum Iron • Pig Iron • Sheets • Plates • Strip • Bars (Hot Rolled and Cold Drawn) • Pipe • Tubing • Roofing • Nails • Spikes Wire • Fencing • Tin Plate • Boiler Tubes • Conduit Steel Building Products • Standard Steel Buildings

BERGER MANUFACTURING DIVISION • STEEL AND TUBES, INC.
NILES STEEL PRODUCTS DIVISION • TRUSCON STEEL COMPANY
UNION DRAWN STEEL DIVISION

"A Bolt's a Bolt?"

No two peas in a pod are alike. Nor are two bolts made by different manufacturers identical. Compare them closely . . . you'll see the difference.

Examine an Upson Quality bolt. Look at the full, square head. It is made to stand heavy wrenching and strain—to prevent wrench slippage and skinned knuckles. Notice the smooth, uniform shank. It's made of tough Republic steel that resists stress. It's accurate in size from end to end.

Run your fingers over the threads. Feel how sharp, deep-cut and clean they are. Turn on a nut. See how easily it runs—neither too loose nor too tight—just right.

A bolt's a bolt? Maybe so at first sight—but only then. You'll know the difference when you use Republic Upson Quality headed and threaded products. Ask your jobber or write us for quotations. Republic Steel Corporation, Bolt and Nut Division, Cleveland, Ohio and Gadsden, Alabama.

The Republic Upson Quality line of headed and threaded products includes more than 5000 standard items carried in stock. Special items are made to specification. Material may be alloy or carbon steel, ENDURO Stainless Steel or Toncan Copper Molybdenum Iron. All standard finishes are available. Whatever you need, if it's headed or threaded, Republic can supply it.

WHY THE ROTOCURE PROCESS OF PRODUCES

THE BWH Rotocure Process of Continuous Vulcanization is the only practical method of producing uniform rubber belting entirely free from press overlaps. It solves the problem because the belting is processed on an exclusive patented rotary type of press, radical in principle. It substitutes uniformity for variation by making the vulcanizing process automatic instead of spasmodic. Uniformity results not from the skill or experience of the operator, but from the unvarying precision of the machine. The result: a uniform belt uniformly vulcanized and uniformly stretched, that will give uniform service.

The advantages of continuously vulcanized belts and the economy which they represent in the operation of your plant cost you nothing. BWH belts, made by this process, are competitive in price. You pay no premium for this extra measure of quality and service. It is only necessary to order belting by name and specify the BWH brand which best suits your service requirements.

BOSTON WOVEN HOSE

CONTINUOUS VULCANIZATION

BETTER BELTS

BULL DOG

For the severest requirements of drive and endurance. Extreme and uniform flexibility to meet difficult driving conditions. The gold standard of belt value. No drive too hard. No service too severe.

WARRIOR

Built of special 32-oz. duck, folded construction, highly resistant to stress and strain, and with high quality friction between the plies. For hard general use where sturdy and consistent performance is required.

PERFECTION

Built on a proved principle — many plies of relatively light-weight duck instead of a few plies of heavy duck. Widely used in the lumber industry on woodworking machinery; also for motor fan and centrifugal pump drives.

The above belts are made in all standard widths and any number of plies to meet specified conditions. Made endless if desired.

& RUBBER COMPANY CAMBRIDGE MASS. U.S.A.

WESTINGHOUSE PROVIDES THE ANSWER IN DOLLARS AND CENTS

REDUCES POWER BILLS

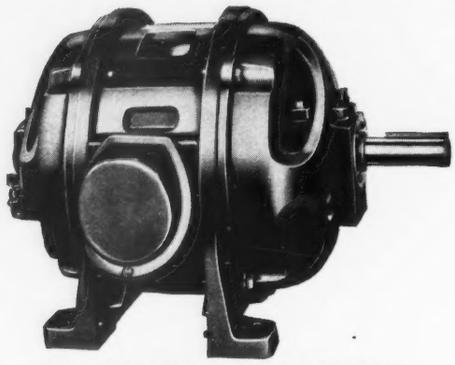
Improve power factor . . . Reduce amount of current line must carry between capacitor and source of power . . . Reduce line drop and effect better line regulation.

★ ★ ★

WESTINGHOUSE CAPACITORS

EXTRA STRENGTH AT NO EXTRA COST

Extra mechanical strength in one-piece frame. Extra electrical strength in Tuffernell insulation. Ball or sleeve bearings, both with exclusive Westinghouse features that eliminate lubrication grief.



WESTINGHOUSE MOTORS

HIGH SPEED MOTOR EFFICIENCY FOR SLOW SPEED DRIVES

You get the exact horsepower needed at the rpm of the driven machine. Simplifies installation . . . eliminates maintenance of belts, pulleys, sprockets and chains.

WESTINGHOUSE GEARMOTORS

ALL NECESSARY CONTROL IN ONE PACKAGE

Saves wiring, conduit and labor . . . Costs less to install . . . Gives magnetic starting, overload protection, manual disconnect switch and Nofuze Circuit protection.

★ ★ ★

COMBINATION LINESTARTERS

Westinghouse

For new Boiler and Steam Drive - #30,000.00

For 12 Westinghouse Gearmotors - #6,744.00

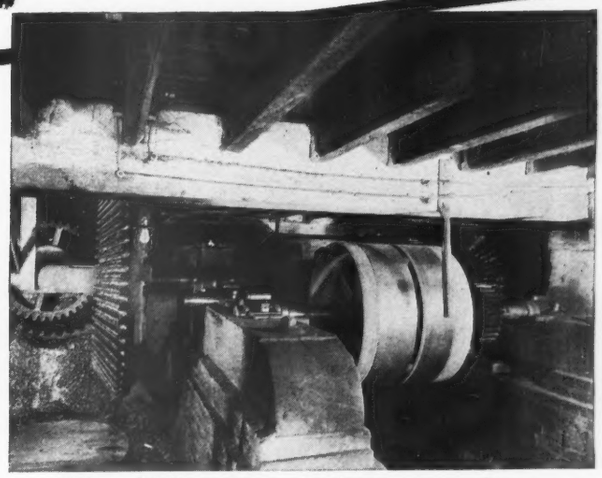
Savings - #23,256.00

SNUFF COMPANY MODERNIZES PLANT...GAINS IN EFFICIENCY AND FLEXIBILITY

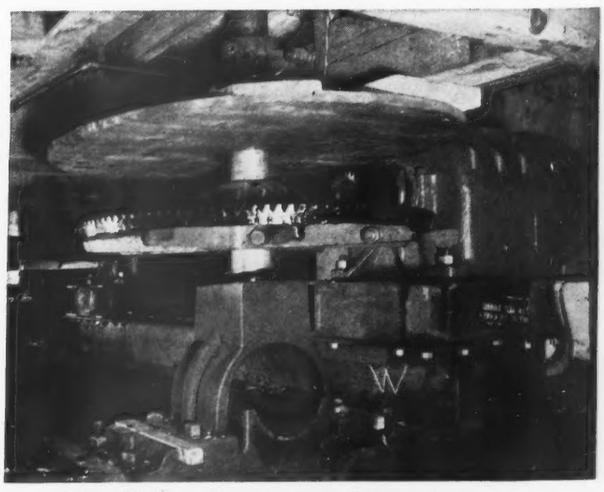
A leading American snuff manufacturer was confronted with the necessity of rehabilitating steam power equipment. A new boiler, steam engines and lineshaft drives would cost about $30,000.00. A Westinghouse gearing expert pointed out that 12 gearmotors, in place of a complete new drive, not only would permit utilizing the existing gears, but would save the company more than $23,256.00 in capital investment. While operating costs are comparable, the gearmotors offer the additional advantage of flexibility. As a result, the company operates only the grinders needed to meet production instead of all of them as under the former system.

In every phase of industry, manufacturing engineers and management are effecting savings and like efficiency through the greater flexibility by use of Westinghouse motors and control. Perhaps your plan of modernization could use this unique Westinghouse service. If you are interested, simply write the nearest Westinghouse office or correspond direct with Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Department 7-N.

J-90191



Before Modernization — Ponderous gears, heavy lineshaft, and huge belt pulleys operated these snuff mills. In case of trouble, the entire line had to be shut down.

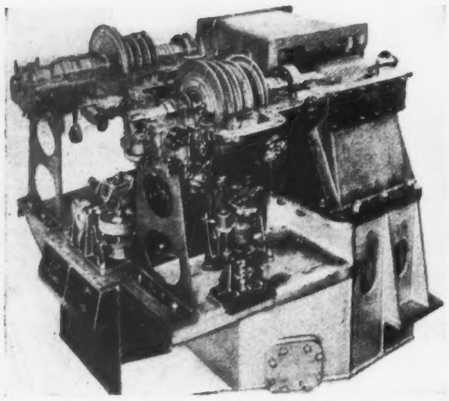


After Modernization — twelve Westinghouse gearmotors, providing exact speed and horsepower for the driven load — at one-fifth the cost.

Motors and Control

U.S.A.'s FIRST TURBINE LOCO

"Call in Soco



The Turbine for Union Pacific's New Steam-Electric Locomotive

THE TURBINE ABOVE powers one unit of Union Pacific's new 5000-h.p. locomotive.

This turbine develops 2500-h.p. Turns up 12,000 r.p.m. Uses steam at 1500 lbs. pressure.

Problem: The oil must be light enough to lubricate the turbine...yet heavy enough to protect precision reduction gears.

No existing oil could do that job!

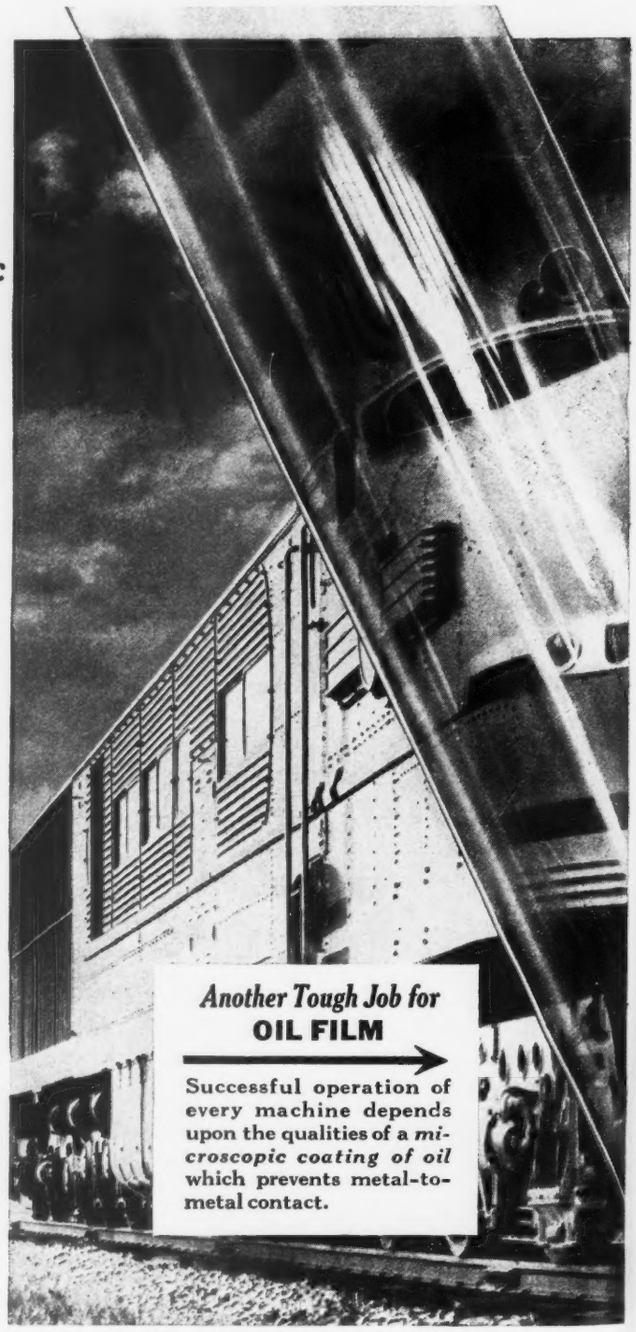
Because of their long, successful experience in turbine lubrication, Socony-Vacuum engineers were called in. Working with the turbine builder's staff they developed a new oil...tested it severely.

It was the right oil.

This was typical. The makers of Gargoyle Lubricants were *first* to supply correct oils for the steam engine, the steam turbine, the Diesel and textile's high-speed spindles.

Whenever Industry moves ahead, Socony-Vacuum keeps step with "Correct Lubrication."

"Call in Socony-Vacuum"—today—and take advantage of 73 years' lubricating experience.



Another Tough Job for **OIL FILM**

Successful operation of every machine depends upon the qualities of a *microscopic coating of oil* which prevents metal-to-metal contact.

MOTIVE PROVED IT PAYS TO_

ny-Vacuum!"

SOCONY-VACUUM

Industrial Service and Lubricants Help to Lower Costs by

Correct Lubrication

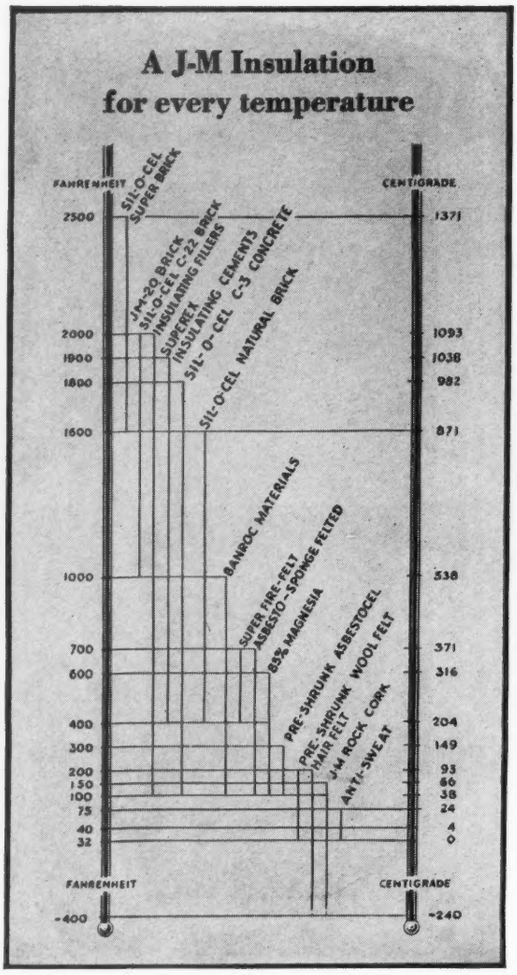
GARGOYLE
Lubricants

SOCONY-VACUUM OIL CO., INC.

Standard Oil of New York Division · White Star Division
Lubrite Division · Magnolia Petroleum Company
Chicago Division · White Eagle Division · Wadhams Division
General Petroleum Corporation of California

ANY INSULATION WILL SAVE YOU MONEY...

BUT WHICH WILL SAVE THE MOST?



Only the right material in the most economical thickness will give you complete protection against excessive fuel losses

EVEN the wrong type or thickness of insulation will save you *some* money. But the amount is small compared to the savings made by applying the *correct materials* in the *correct thickness*. You can get *all* the savings that insulation can give with the help of the Johns-Manville Insulation-Engineering Service.

Johns-Manville offers a complete line of insulations in brick, block and pipe-covering form for every temperature and service condition. J-M Engineers will be glad to work on any problems you may have . . . apply to them Johns-Manville's 81 years of intensive research and practical experience in the insulation field. These men will tell you exactly what material provides greatest operating efficiency . . . just what amount will pay the greatest return on your insulation investment.

Hundreds of plants all over the country have used this helpful J-M Service to secure better temperature control . . . maximum fuel savings. Why not let a trained J-M Engineer make a complete study of your requirements? For full details and complete information on J-M Industrial Insulations, write for Brochure IN-55-A. Johns-Manville, 22 East 40th Street, New York City.

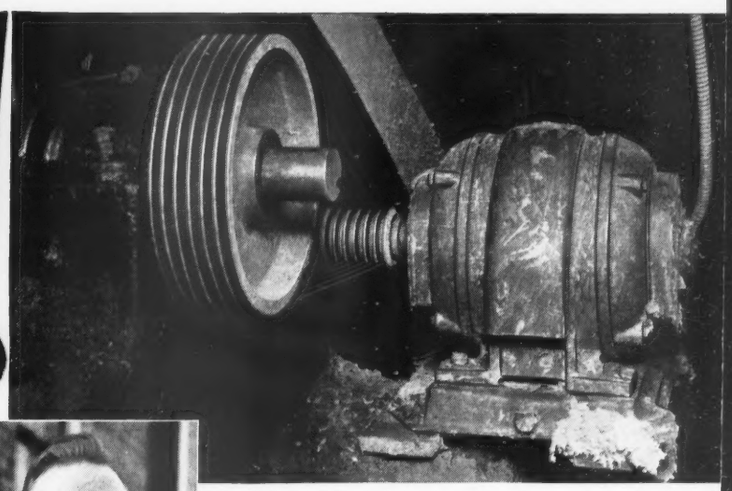
JOHNS-MANVILLE JM PRODUCTS

Johns-Manville INDUSTRIAL INSULATIONS

For every temperature . . .
For every service condition

REDUCE YOUR FUEL COSTS IN 1939

HOW TEXROPE DRIVES PROVED THEY COULD TAKE IT IN A RAINSTORM OF PULP!



Another true case history from the Allis-Chalmers files that proves **"IT PAYS TO BUY THE EQUIPMENT THAT PAYS FOR ITSELF!"**

THE TEXROPE DRIVE and Allis-Chalmers Lo-Maintenance Motor soon looked like this under the continuous rain of pulp at the Tennessee Paper Mills, Chattanooga! But they kept on running . . . through the same pulp and vibration difficulties that had stopped other drives!

L. T. Murphy, Plant Superintendent of the paper mills, says—"Texrope Drives are helping to keep our operating costs down."

Large Paper Company Solves Its Slippage Problems with Allis-Chalmers Texrope Drives . . . Eliminates Vibration Losses! Get the Story of Texrope's Low-Cost Performance...of the Big Savings it Means to You!

If you have perplexing power transmission problems . . . if you are the kind of operator who wants outstanding performance from your drives even when the going gets tough . . . then you'll want to find out how Allis-Chalmers Texrope Drives can give you that kind of performance and save you money at the same time!

Here's what happened at the Tennessee Paper Mills, Chattanooga! They had drive problems . . . plenty of them! A continuous rainstorm of pulp fell on the belts . . . made them wet . . . slippery . . . inefficient! Other methods of power transmission were tried . . . and they, too, failed!

Switched to Texrope!

Then . . . they switched to Texrope Drive! But let L T. Murphy, superintendent of the plant, tell you what happened —

"We were frankly skeptical that we could find any drive that would operate our four vibrating paper stock screens completely satisfactorily. In February, 1938, we ordered a 3 hp Allis-Chalmers Motor and Texrope Drive. We were immediately pleased to find that the vibration and rain of pulp made no difference to the new drive's efficiency.

"In June, we ordered two more motors and drives; and in December ordered the one remaining screen to be equipped with Allis-Chalmers motor and Texrope Drive. We find they operate perfectly even under these conditions and they are helping to keep our operating costs down."

That's the kind of performance thousands of industrial organizations are getting today with Allis-Chalmers Texrope Drives. And that's the kind of performance you'll get! When you use Texrope Drives, you get a smoother, more positive drive . . . long life . . . reduced operating costs!

Save Money with Texrope!

Texrope Drives are available for practically all industrial needs between ¼ hp and 2,000 hp. Call or write the Allis-Chalmers district office near you for complete Texrope information. Let a Texrope-trained engineer help you improve your plant efficiency . . . lower your costs!

Vari-Pitch Speed Changers • Texrope V-Belts • Duro-Brace Texsteel Sheaves • Vari-Pitch Sheaves • Standard Cast Iron Sheaves • Adjustable Pitch Diameter Texsteel Sheaves • 2-3-4 Combination Sheaves • Straitline Automatic Motor Bases • Oil Field Drilling Rigs

1037 Belts by Goodrich

TEXROPE DIVISION
ALLIS-CHALMERS
MILWAUKEE · WISCONSIN

NO PLACE FOR WEAKLINGS!

Here's an Amazing True Story of How 17 Allis-Chalmers Lo-Maintenance Motors Proved Their Low Maintenance Costs! Get the Facts on Full Measure Protection in Lo-Maintenance Motors, on the Savings It Means to You!

Another true case history from the Allis-Chalmers files that proves **"IT PAYS TO BUY THE EQUIPMENT THAT PAYS FOR ITSELF!"**

LOOKS BAD, DOESN'T IT? BUT THIS Allis-Chalmers Lo-Maintenance Motor—like the rest of the original 17 in this chemical plant — is still running as perfectly as the day it was installed . . . giving dependable daily service in motor-ruining chemical dust.

Operating where dust filled the air . . . fine chemical dust that bit like acid . . . that's a cruel test for any motor to pass! But it's the kind of test that brings out motor differences that might otherwise take months of normal operation to show up! And it's the kind of test that gives Allis-Chalmers Lo-Maintenance Motors a chance to prove their Full Measure Features!

There were 39 motors on the job in this large Southern chemical plant — 17 Allis-Chalmers and 22 of six other makes. All were operating under the same adverse conditions. But here's what the officials of the chemical company discovered when they checked repair and maintenance costs after two years of service!

For the 22 motors of other makes, the total upkeep cost was more than $500.00! But for the 17 Allis-Chalmers motors, the total repair bill was the sensationally low figure of $17.30!

Orders 18 More!

That's the reason this company ordered 18 additional motors . . . made Allis-Chalmers first choice in their plant! And that's the reason Lo-Maintenance Motors are fast becoming first choice in hundreds of plants throughout the country!

For when you buy a Lo-Maintenance Motor, you get more than a motor that delivers just a rated horsepower. You get a motor that has built into it the results of Allis-Chalmers' 90 years of advancing with industry . . . of making motors to meet the rigid requirements of their own famous line of heavy duty industrial equipment.

High carbon steel frame . . . indestructible rotor . . . husky all-around construction with no skimping materials . . . add them together and you get a motor that's built for long life . . . without running up costly repair bills!

Get the Full-Measure story on Lo-Maintenance Motors. Call the nearest Allis-Chalmers district office or write direct to Allis-Chalmers. Find out how you can cut maintenance . . . keep production steady . . . with Allis-Chalmers Lo-Maintenance Motors!

MOTORS FOR ALL APPLICATIONS FROM ½ HORSEPOWER AND UP

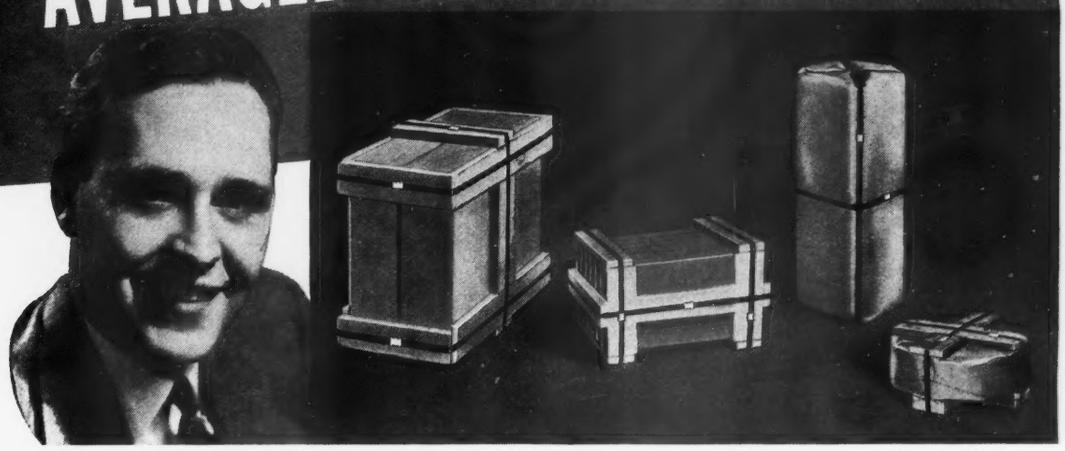
ELECTRICAL DIVISION

ALLIS-CHALMERS

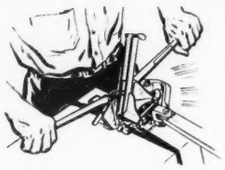
MILWAUKEE·WISCONSIN

1030

"COST REDUCTIONS *After Production* AVERAGED 20c PER UNIT—



When Acme Steelstrap, Seals and Tools Were Used"



Manufacturers in every industry are stopping profit leaks beyond their production lines—by utilizing Acme Steelstrap, seals and equipment *correctly.*

For example, the savings, in material, labor and transportation costs, for the shipments illustrated above, average 20 cents per unit. Reductions in tare weight average 15 lbs. per package. (The smallest reduction amounted to 65%.) And in addition, damage claims were eliminated by this simple, easy Acme method of making shipments "Bound to Get There."

The chances are 10 to 1 that you, too, can make important savings by using Acme Steelstrap and equipment in your packing and shipping department. Practically every type of product—whether shipped in cartons, boxes, crates, bundles, skids or in carload lots—can be made ready and shipped faster, safer and more economically with Acme equipment.

The new "Strapbook" gives many "before and after" comparisons and illustrates numerous methods in which Steelstrap is being used effectively. Let us send you a copy—it may help you lower costs *after production has been completed.* Just mail the coupon—there is no obligation.

ACME STEEL COMPANY
2831 ARCHER AVENUE, CHICAGO, ILLINOIS
Branch Offices in All Principal Cities
Acme Steelstrap
FOR MAKING SHIPMENTS
Bound to Get There

ACME STEEL COMPANY
2831 Archer Avenue, Chicago, Illinois
☐ Send the new "Strapbook"
☐ Have the nearest Acme engineer call.

Name.....

Address.....

City.....*State*.....

QUICK QUIZ FOR FACTORY EXECUTIVES!

Which of These Types of Permite Ready-Mixed Aluminum Paint Will Solve Your Painting Problems?

TO meet the varying needs of industry, Aluminum Industries, Inc., has developed 13 different types of Permite *Ready-Mixed* Aluminum Paint.

Whether you need aluminum paint — indoors or outdoors, or for product finishing — whether your painting problem is Better Reflectivity . . . Presence of Acids . . . Fumes or Greases . . . Quick Drying . . . Temperatures up to 1000°F. . . . Wet Surfaces . . . Checking . . . Waste in Mixing . . . or Costly Leftovers, there is a Permite *Ready-Mixed* Aluminum Paint to meet your needs.

And *Permite* Aluminum Paint, produced in the world's only exclusive aluminum paint plant, comes to you *successfully* Ready-Mixed. Just open and use. Ends all bother and waste of mixing aluminum paint on the job. Won't discolor or harden in the can. Leftovers can be used next day or next week.

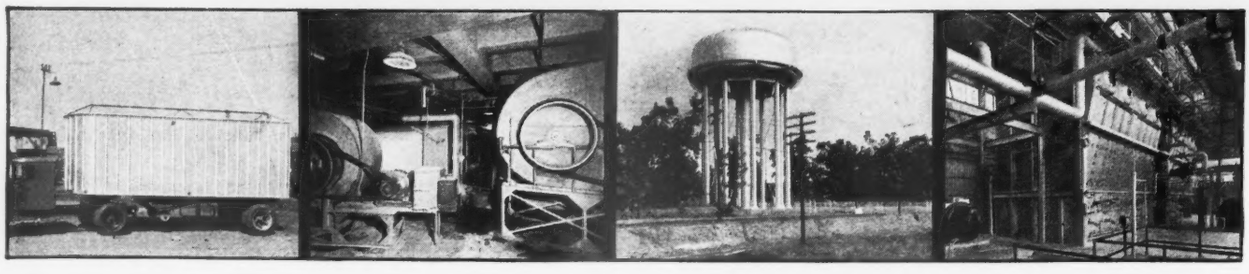
Think what this means in savings. Think of the savings, too, that Permite can give you because it "costs less by the foot."

Ask your supply house or, without obligation, write for full details and prices today.

ALUMINUM INDUSTRIES, Inc., CINCINNATI, OHIO *Distributors in Principal Cities*

PERMITE READY MIXED ALUMINUM PAINTS

A COMPLETE LINE . . . . A TYPE FOR EVERY PURPOSE



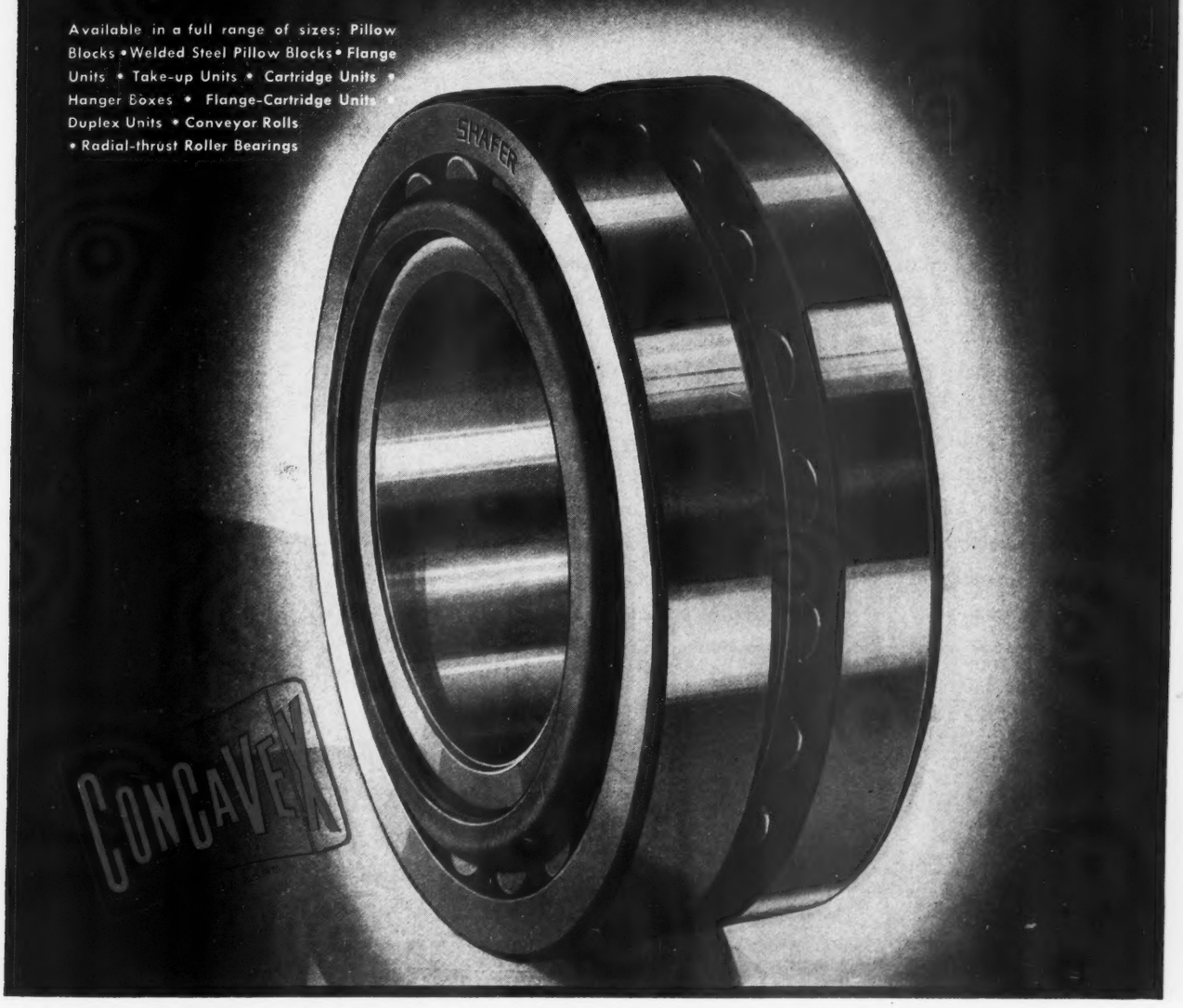
ONLY SHAFER

has the simple CONCAVE roller design that maintains efficient bearing action unchanged under conditions of shaft deflection, misalignment, shock loads. Only Shafer combines: 1. Generous roller bearing capacity for radial, thrust, and combined radial-thrust loads; 2. Integral self-alignment; 3. Simple adjustability.

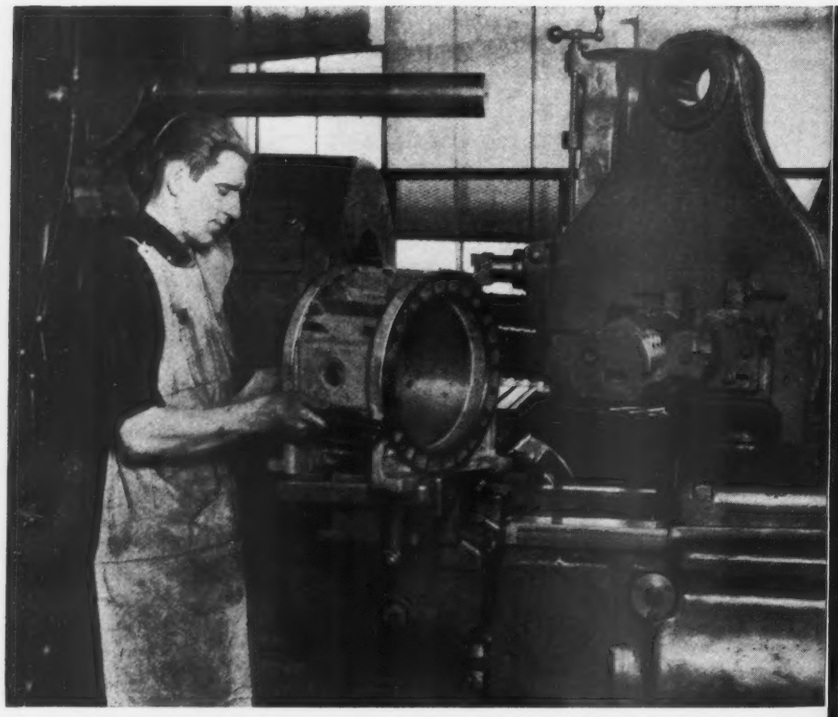
Catalog No. 14 gives complete data on Shafer Roller Bearings and Units. Write for your copy.

SHAFER BEARING CORPORATION • 35 East Wacker Drive, Chicago, Illinois

Available in a full range of sizes: Pillow Blocks • Welded Steel Pillow Blocks • Flange Units • Take-up Units • Cartridge Units • Hanger Boxes • Flange-Cartridge Units • Duplex Units • Conveyor Rolls • Radial-thrust Roller Bearings

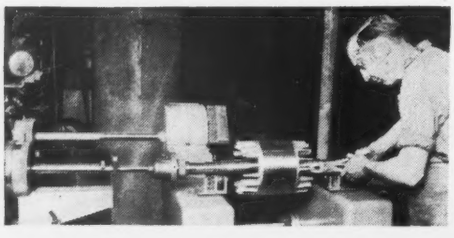


SHAFER *Self-Aligning* ROLLER BEARINGS



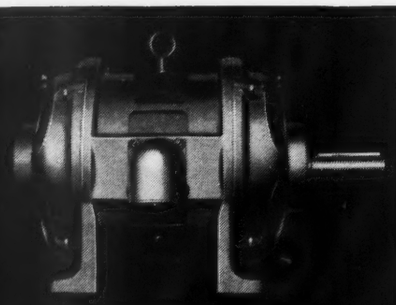
TURN TO THE INDEX
for a story of better alignment

The manufacturing methods employed by Delco to maintain the perfect alignment of Delco motors throughout production are interesting—and they are important to the user's final satisfaction. Typical of these methods is the operation pictured here. After the motor frame feet have been milled and drilled in one set-up, establishing the initial alignment, the holes are indexed in this large turret lathe chuck by four dowel pins. With the casting thus correctly aligned, the stator bore, both ends of the frame and surfaces for the location of end frames are machined in a single group operation. Very close limits on shaft height and alignment are definitely insured, and all alignments must check in succeeding operations. Because the workmanship of Delco motors is exceptional, we ask you to look within the motor you specify. Write for catalog.

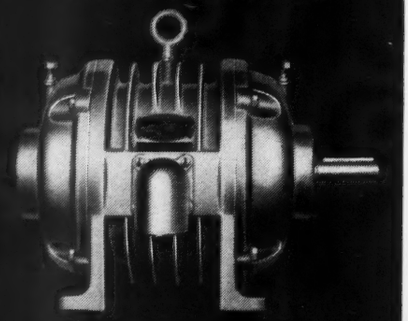


EVERY DELCO MOTOR IS DYNAMICALLY BALANCED

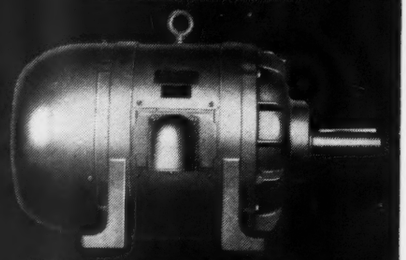
No motor leaves Delco Products that has not been dynamically balanced on a specially-designed balancing machine. Delco balances every motor. Each end of the rotor and shaft is first balanced independently while the machine indicates exactly how much compensation is required and where it should be applied. After all adjustments have been made, the complete rotating assembly is given a final check. Delco motors assure satisfactory balance.



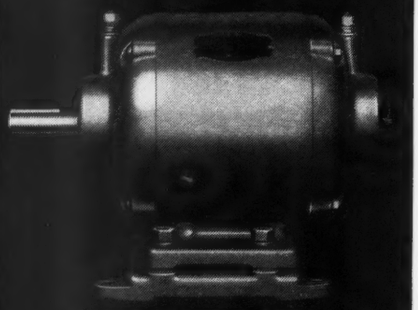
Open Frame, Sleeve or Ball Bearing



Totally Enclosed Ball Bearing



Totally Enclosed Fan-Cooled Ball Bearing



Fractional Horsepower Motor

• • •

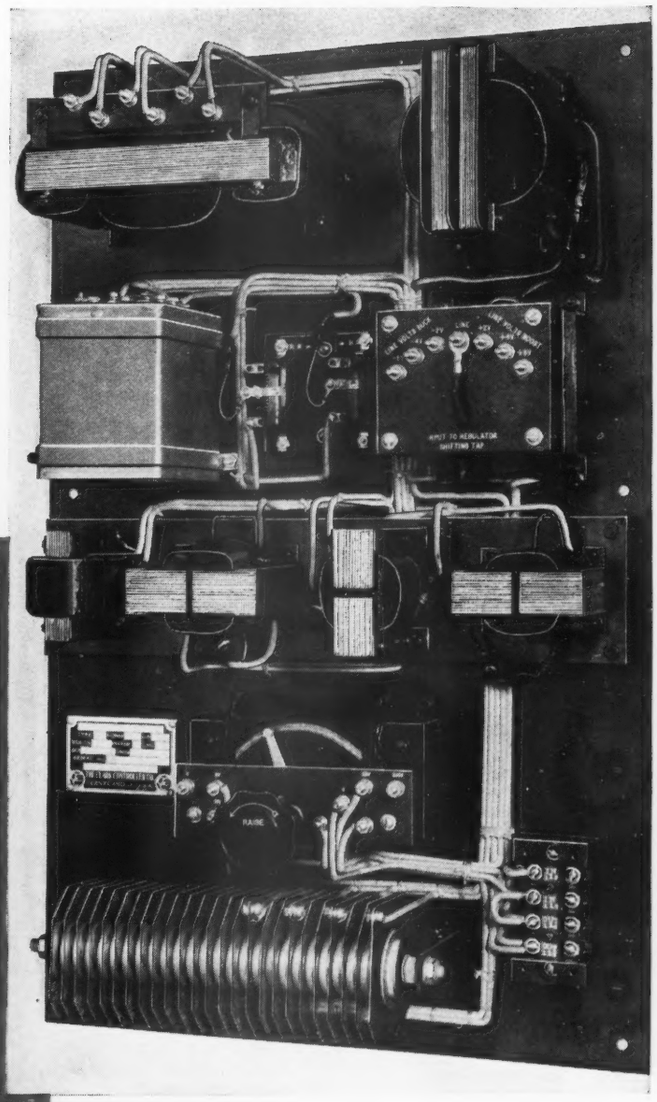
Delco industrial AC motors are available in various types, possessing electrical and mechanical characteristics to meet practically every requirement.

Normal starting torque—normal starting current—high starting torque—low starting current—as well as high slip. Each type available in open frame, sleeve or ball bearing—totally enclosed ball bearing—totally enclosed fan-cooled ball bearing—also multi-speed motors. Electrical and mechanical modifications available. Delco motors comply with NEMA standards.

DELCO MOTORS

DIVISION OF GENERAL DELCO PRODUCTS DAYTON, OHIO MOTORS CORPORATION

Voltage Regulation? The "Yes and No" about the Clark Bulletin 4000 Autovolt Regulator



Yes! **Operation is entirely Automatic.**

Yes! **Regulation starts immediately.**

Yes! **Constancy of output voltage is maintained.**

Yes! **Accuracy is very high.**

No! **There are no moving parts.**

No! **There is nothing to wear.**

No! **There is no maintenance, nor replacement.**

No! **There is no wave form distortion.**

YES! *A fully descriptive folder is yours for the asking. Just ask for Bulletin 4000.*

EFFICIENCY

Approximately 95%—Varies with size and loading of regulator.

RESPONSE

5 cycles for maximum load change. 14 cycles for maximum line voltage change.

ACCURACY

Plus or Minus ½ of 1% is standard. Greater accuracy is available on special order.

WAVE FORM

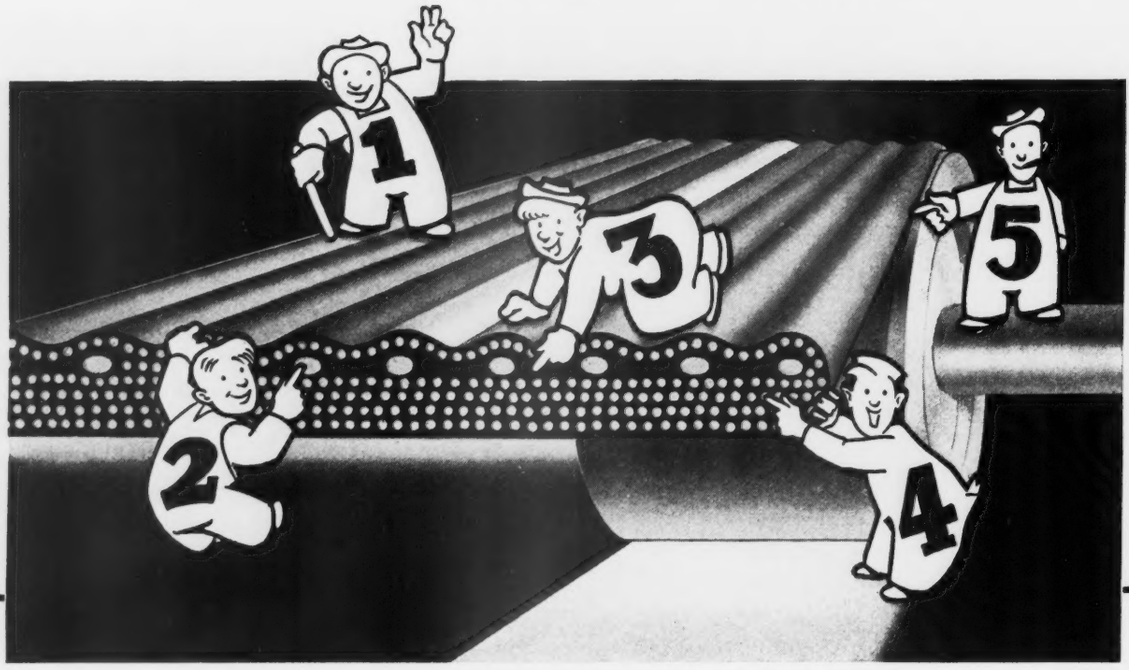
No distortion of wave form.

OFFICES IN PRINCIPAL CITIES

THE CLARK CONTROLLER CO.

1146 EAST 152ND ST. CLEVELAND, OHIO

THE *Gilmer* GANG GIVES YOU 5 REASONS FOR DELIVERING REAL MAXIMUM POWER WITH KABLE KORD



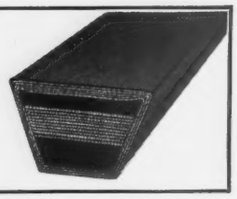
Gilmer KABLE KORD is different from every other belt made. KABLE KORD is a "two-in-one" flat belt that's strong because its *pulling cords* plus *contactor cords* are welded into a rubber-locked unit that is protected by a rugged jacket.

The world-famous *Gilmer Grip* results when KABLE KORD hugs flat pulleys *tighter* with the no-slip grip. Waste goes out the window... operating costs drop... you get maximum POWER per-square-inch . . . with KABLE KORD.

Factory Branches and Warehouses :

Atlanta, Ga., 95 Pine Street
Chicago, Ill., 351 East Ohio Street
Houston, Texas, 1015 N. San Jacinto Street
New York, N. Y., 50 Church Street
Newark, N. J., 115 Edison Place
San Francisco, Cal., 510 Bryant Street
Seattle, Wash., 307 Maritime Building
Tulsa, Okla., 802 Archer Street

Another belt with the famous "Gilmer Grip that Can't Slip !" is the Gilmer "PRECISION-PLUS" V-Belt for multiple drives and f.h.p. jobs. The Gilmer Gang gets belts to you *fast* . . . when you need 'em ! There's a fully-stocked Gilmer distributor near you.



FREE Kable Kord Data Book: Facts and figures about this patented wonder belt that comes endless and in rolls. Write today to

ONLY KABLE KORD GIVES YOU THESE 5 FAMOUS FEATURES

Corrugated surface—acts with contactor cord to insure terrific gripping qualities of the belt on the pulley.

Kable Kords — act as contactor belt, squeezing the pulling section of the belt tightly against the pulley.

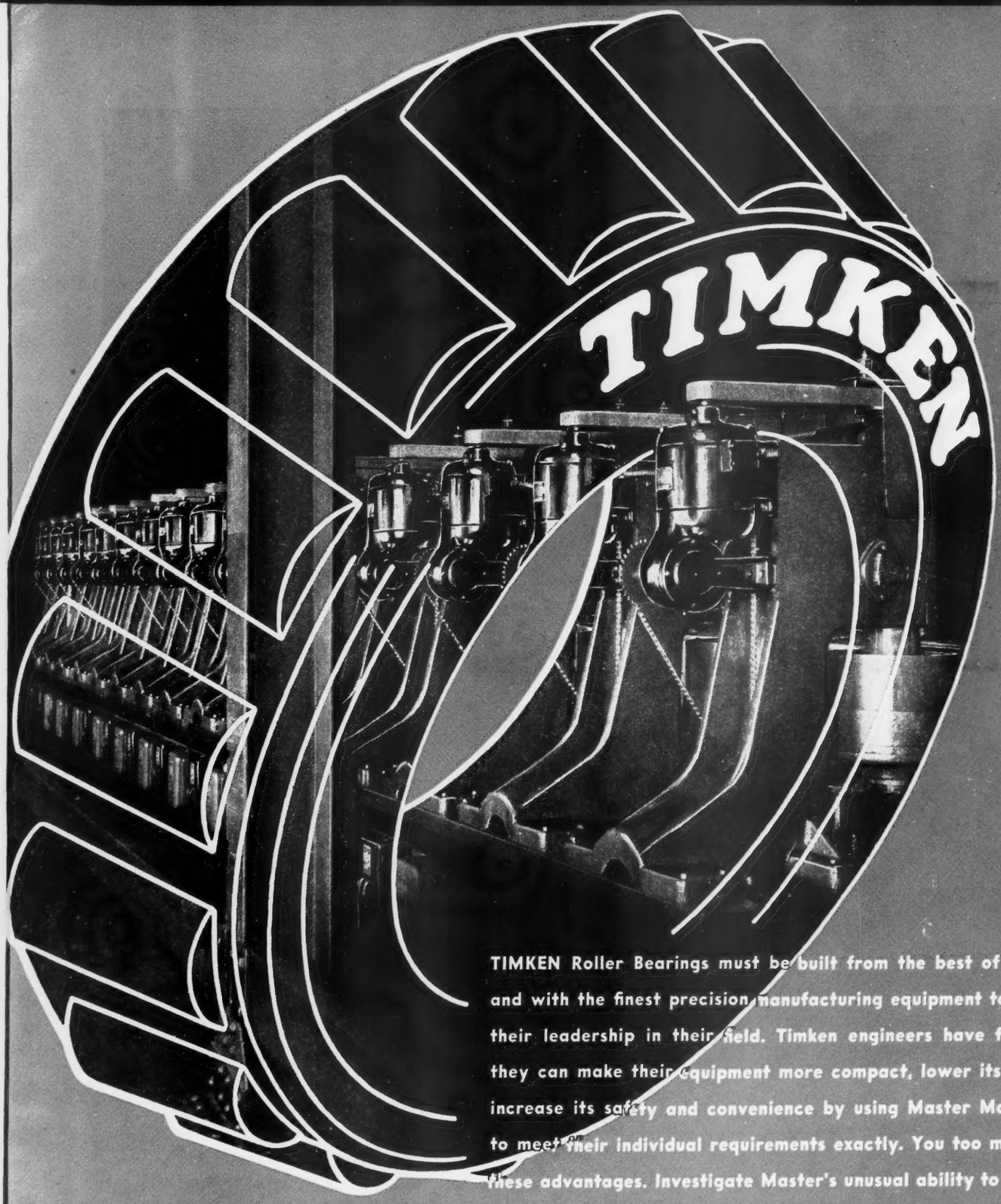
High friction, heat-resisting rubber—a tough resilient rubber especially developed by Gilmer engineers to insure cool running at high speed.

Rubber-locked pulling cords—patented construction, concentrating brute strength in thin section, makes cords ride parallel without twisting under pressure.

Controlled belt stretch—pre-tested to guarantee the permanent belt length under working tension.

L. H. GILMER COMPANY, Tacony, Philadelphia

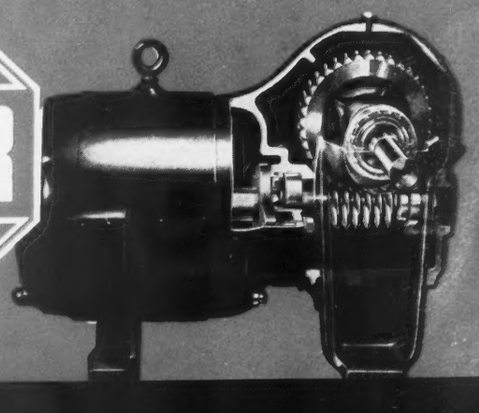
The Oldest Firm of Rubber Fabric Belt Specialists

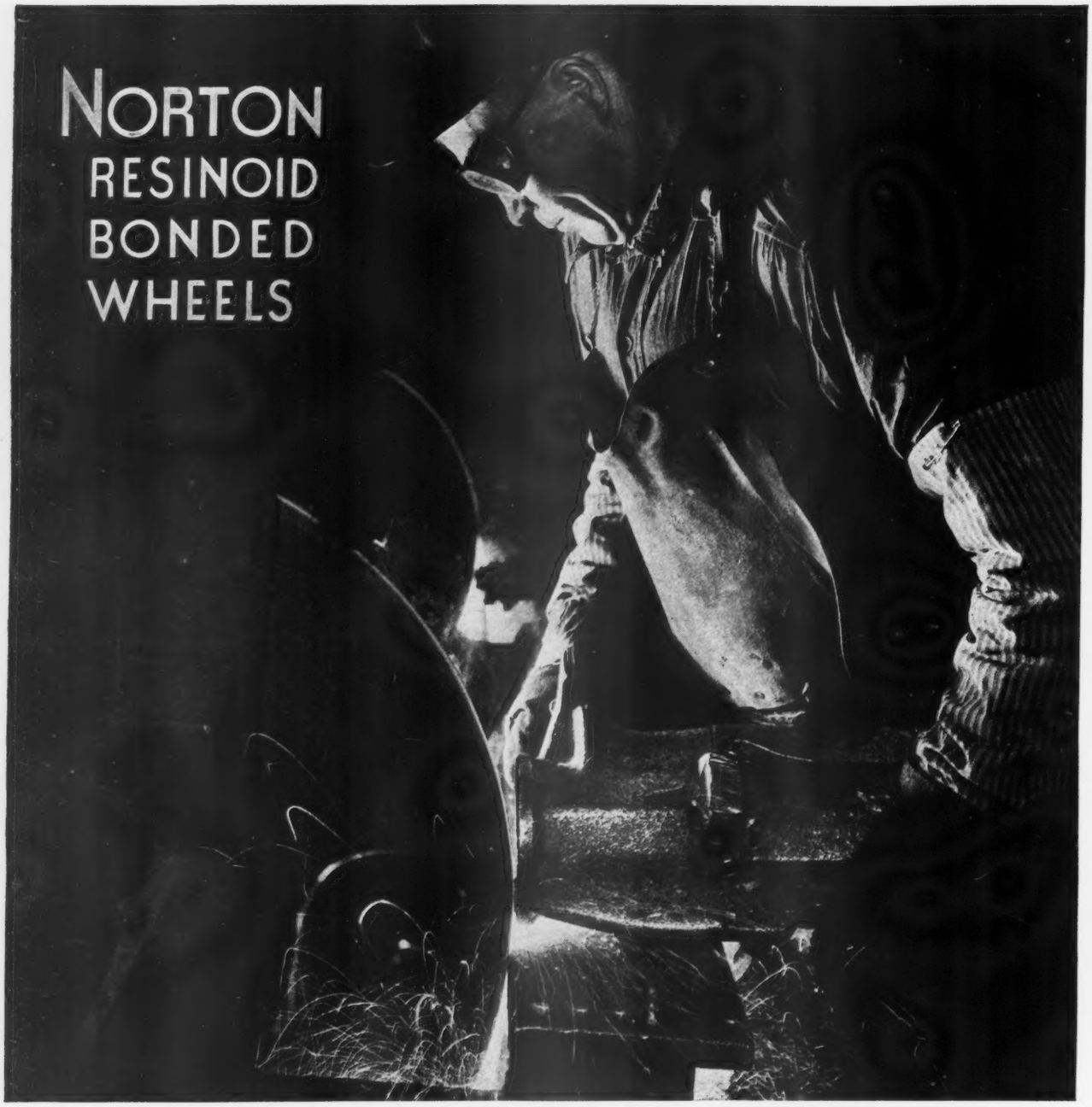


TIMKEN Roller Bearings must be built from the best of materials and with the finest precision manufacturing equipment to maintain their leadership in their field. Timken engineers have found that they can make their equipment more compact, lower its cost, and increase its safety and convenience by using Master Motors built to meet their individual requirements exactly. You too may secure these advantages. Investigate Master's unusual ability to serve you promptly and economically, with motors that really fit your needs.

THE MASTER ELECTRIC COMPANY • DAYTON, OHIO

MASTER





THE complete line of Norton Resinoid Wheels is making it possible to cut grinding costs on many jobs. Special bond formulae have been developed by the Norton laboratories for each type of work—wheels for high speed snagging and billet grinding, for cutting-off, for camshaft grinding, for roll grinding and disc wheels for surfacing. And all Norton Resinoid Wheels are made by the exclusive controlled structure process.

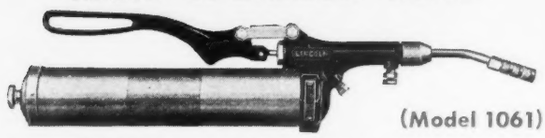
NORTON COMPANY, WORCESTER, MASS.

NORTON ABRASIVES

.....Just a couple easy pushes do the job

Model 1016 Utility Gun

HAND OPERATED GUNS



(Model 1061)

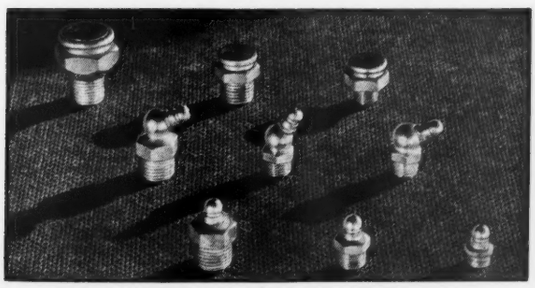
LEVER-TYPE GUNS are available in both high pressure and volume types, with attachments for Push Type, Pin Type and Button Head Fittings. Model 1061 (illustrated above) handles all types of lubricants and develops pressures up to 10,000 lbs.... Capacity 18-ozs.

POWER OPERATED LUBRIGUNS

Model 309 Twin Cylinder Airline Lubrigun is one of many power operated units made by Lincoln. Dispenses lubricant from 100-lb. drum.

LINCOLN also makes a complete line of Grease FITTINGS

Lincoln KLEENSEAL, Button Head and Pin Type Fittings in all types and sizes are available for replacement and modernization needs . . . Ask for details.



It will pay you to get details on

LINCOLN

LUBRICATING EQUIPMENT

Lincoln makes a wide range of equipment for the most efficient application of grease lubricants. The line is complete. It includes small KLEENSEAL Grease Guns such as the Model 1016 shown above. All Lincoln models of this type provide a fast, clean, economical method of lubricating machinery equipped with KLEENSEAL, Zerk or hydraulic fittings. These guns handle all types of greases and heavy oils—and a few pushes on the plunger knob of a gun like Model 1016 lubricates the bearing.

Lincoln also makes a full line of air-operated and also electrically operated lubricant units for dispensing lubricant directly from 25-lb., 50-lb., 100-lb., and 400-lb. original containers. Lincoln Flex-O-Matic Systems deliver lubricant from a central source to all bearings on any machine which has been equipped with a Lincoln Flex-O-Matic Injector System.

(Model 309)

By Invitation Member

Emblem of BUSINESS CHARACTER

Rice Leaders of the World Association

Represents High Standing in NAME - PRODUCT - POLICY

Consult your nearest Lincoln distributor or write us

LINCOLN ENGINEERING COMPANY

PIONEER BUILDERS OF LUBRICATING EQUIPMENT

GENERAL OFFICES: ST. LOUIS, MO. FACTORIES: ST. LOUIS, MO., DETROIT, MICH.

ECONOMY COMES IN A 'TUBE'

REPUBLIC BUILDS AN AIR HOSE OF RUGGED CONSTRUCTION FOR A TOUGH JOB

Conditions encountered in pneumatic tool work make the maintenance of air hose a costly proposition. In answer to the expense for air hose upkeep, Republic offers a tube of economy in Tower Pneumatic Hose. This tube of carefully compounded rubber inside of a strong, resilient cord body is recognized for the noticeable decrease in operating costs it affords.

Applications on air drills, hammers, tampers, drivers and other pneumatic hose service have proved the strength and ruggedness of Tower's construction. The smooth inner tube has the desireable features of that used in oil-conducting hose . . . in addition to heat-resistant properties. Multiple braids of tightly twisted cords set in pairs afford a strong yet resilient carcass. Shock and abuse are resisted by the special braid construction and rubber compound which impregnates the plies and bonds them together. And finally, the characteristic tough brown cover provides protection against abrasion, cutting action of sharp rock, exposure to sun and other deteriorating elements.

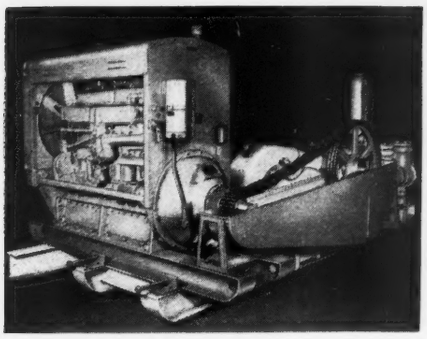
All the facilities for research and experiment which were put to work to develop this pneumatic hose economy are utilized in the manufacture of Republic Hose, Belting, Packing or Molded Rubber Goods. Republic Rubber Division of Lee Rubber and Tire Corporation, Youngstown, Ohio.

ORDER REPUBLIC RUBBER PRODUCTS FROM YOUR DISTRIBUTOR

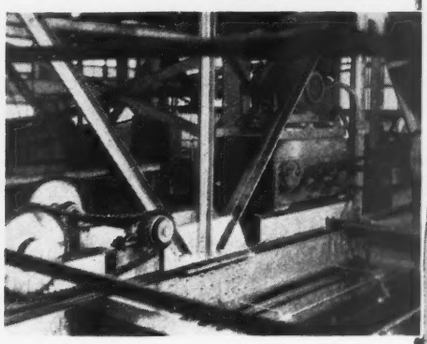
REPUBLIC RUBBER

HOSE • BELTING • PACKING • MOLDED PRODUCTS

BALDWIN
is boon to power users



POWERHOUSE — A gas engine driving a powerful pump. Multiple Strand Baldwin Chain.

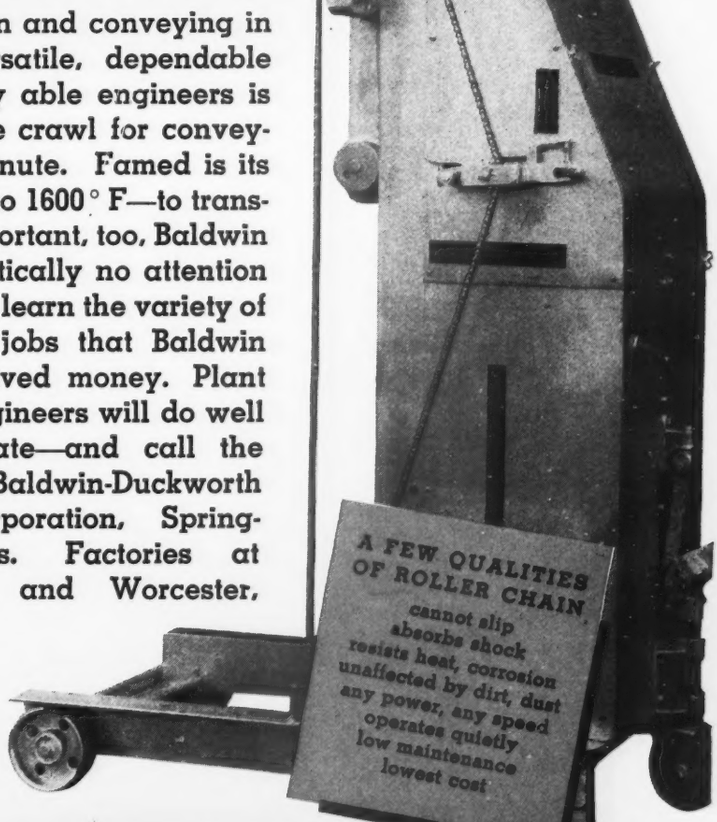


TOUGH SPOT — Baldwin Roller Chain application to drive several conveyors at right angles to one another.

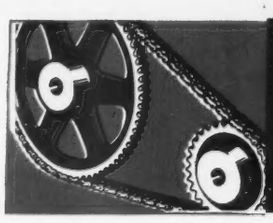
AID to efficient power transmission and conveying in hundreds of industries is versatile, dependable Baldwin Roller Chain. Acclaimed by able engineers is Baldwin's range of speeds from mere crawl for conveying, up to speeds of 4000 feet per minute. Famed is its ability to perform at temperatures up to 1600° F—to transmit up to 1000 horse power. Vitally important, too, Baldwin works well in any position with practically no attention or upkeep expense. It is astonishing to learn the variety of power transmission and conveying jobs that Baldwin Roller Chain has simplified—and saved money. Plant owners, engineers will do well to investigate—and call the B-D Man. Baldwin-Duckworth Chain Corporation, Springfield, Mass. Factories at Springfield and Worcester, Mass.

"Have you heard of the wonderful one-hoss shay
That was built in such a logical way
It ran a hundred years to a day..."

Baldwin Roller Chain, too, is so *logical* in design and construction that it is becoming the preferred means of power transmission among shrewd engineers everywhere.



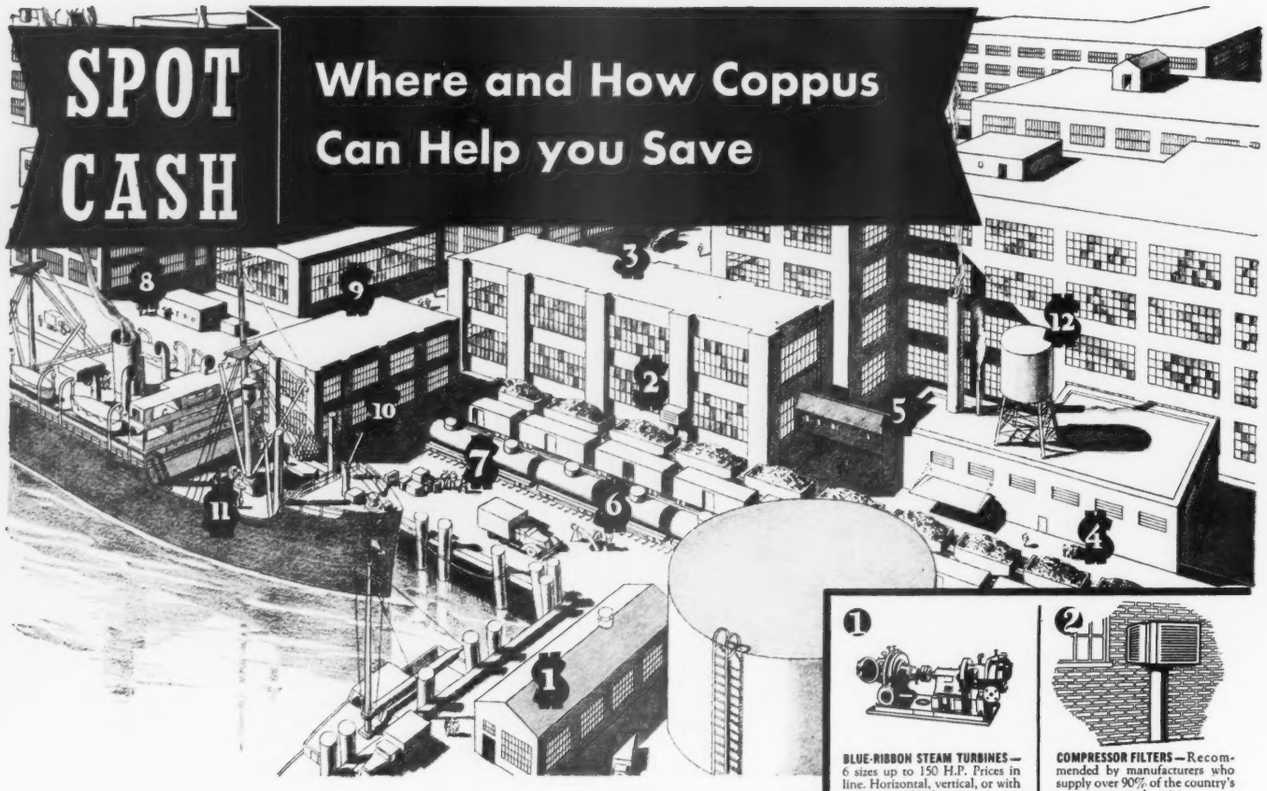
WEIGHT LIFTER—A heavy duty machine for hoisting and moving materials. It is equipped with Baldwin Roller Chain.



BALDWIN-DUCKWORTH

SPOT CASH

Where and How Coppus Can Help you Save



In the spots above — and in many others throughout such plants — Coppus products for moving and cleaning air, turning steam into power, increasing fuel efficiency — are saving money for thousands of smart buying firms.

Those firms specify Coppus because they know that (1) Coppus turbines, gas burners, air filters, blowers, etc. are expertly *designed* for conditions characteristic of their industries, and (2) are *engineered* to fit individual requirements.

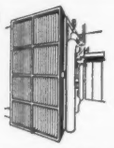
Get acquainted with the many products bearing the Coppus name. Check off below the free bulletins you want.

1

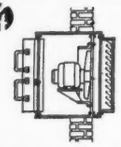
BLUE-RIBBON STEAM TURBINES — 6 sizes up to 150 H.P. Prices in line. Horizontal, vertical, or with built-in speed reducers.

2

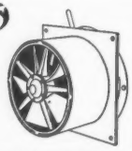
COMPRESSOR FILTERS — Recommended by manufacturers who supply over 90% of the country's compressors and engines.

3 

STATIONARY UNIT AIR FILTER — 95.6% efficient against 2 micron-size silica dust. Highest U. S. commercial rating.

4 

VENTILATOR FILTERS — Combination ventilator-filter unit for laboratories, instrument assembly rooms, etc.

5 

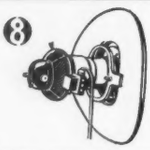
NATURAL GAS BURNERS — Coppus-Dennis Fanmix for industrial applications. Pinwheel action produces perfect gas-air mixture.

6

CABLE MANHOLE VENTILATORS — Fast ventilation of *any* confined space. Electric motor or gasoline engine driven.

7

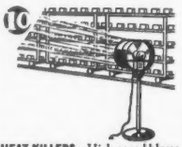
TANK AND TANK CAR VENTILATORS — Supply clean, cool air to men working. On cars — attachable to nipple if desired.

8 

BOILER MANHOLE BLOWERS & EXHAUSTERS — swift cooling and ventilating of boilers, tanks, retorts, etc.

9

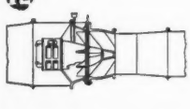
MANCOOLING FANS — Keep production up by keeping men cool. No stale air-recirculation. Air is *directed*.

10 

HEAT KILLERS — High speed blasts for cooling and drying furnaces, motors, generators, *products*, etc.

11

SHIPHOLD VENTILATORS — For exhausting welding fumes and other injurious gases from confined working spaces.

12 

VANO BLOWERS — Fitted to meet any special air problems where ordinary fans fail. They are *most* efficient.

COPPUS

COPPUS ENGINEERING CORPORATION
375 Park Avenue, Worcester, Mass.

CHECK NUMBER OF APPLICATIONS

1 ☐	5 ☐	9 ☐
2 ☐	6 ☐	10 ☐
3 ☐	7 ☐	11 ☐
4 ☐	8 ☐	12 ☐

Mail in for free Bulletin

DESIGNED FOR YOUR INDUSTRY — ENGINEERED FOR YOU

They put us in with the LIONS

The shop foreman gave Shell his toughest job... as a tryout!

IN up-state New York, there's a plant which has a shop foreman who operates on a pretty sensible principle when it comes to putting in a new oil.

He gives the newcomer the toughest job in the plant and lets him *prove* whether he's good or not. "Throwing 'em to the lions," he calls it.

The Shell man was no exception—and he welcomed the chance to prove the worth of Shell Lubricants under the toughest conditions.

This plant was working 18-8 chrome nickel on their automatic machines—and having plenty of trouble with these tough metals. The work was smoking, life of the tools was very short, and the finish in many cases was bad.

The Shell man went to work on these machines, conducting a series of experiments with the cutting oil. After he had completed his tests, he recommended to the foreman the correct type and grade of Shell Cutting Oil.

And the Shell man proved his product! No longer did the work smoke . . . finishes were smoother . . . yet the over-all cost of the Shell product was less than the oil formerly in use. To clinch the point, a check was kept on one nut-tapping machine, and it was found that production had been increased from 50 to 60 pieces per hour!

Have you a particularly tough, troublesome job in your shop? Shell would welcome the chance to show you how costs can be cut . . . production increased . . . with Shell Cutting Oils. These products are doing a great job in machine shops all over the country. Why not put them to work for you? There is a Shell office near you.

SHELL

SHELL *Cutting* OILS

RHOADS TANNATE Leather Belting will give you more and steadier power; grips more surely; endures more, and is long lived - - - because these qualities we control in the making!

From the selection of the hides, through tanning, stretching, drying, cutting-up, laying out, cementing and running-in, TANNATE Belting is subjected to a gruelling series of physical and chemical tests. The belting in each step of its making is measured against rigid standards set for TANNATE . . . every belt must pass.

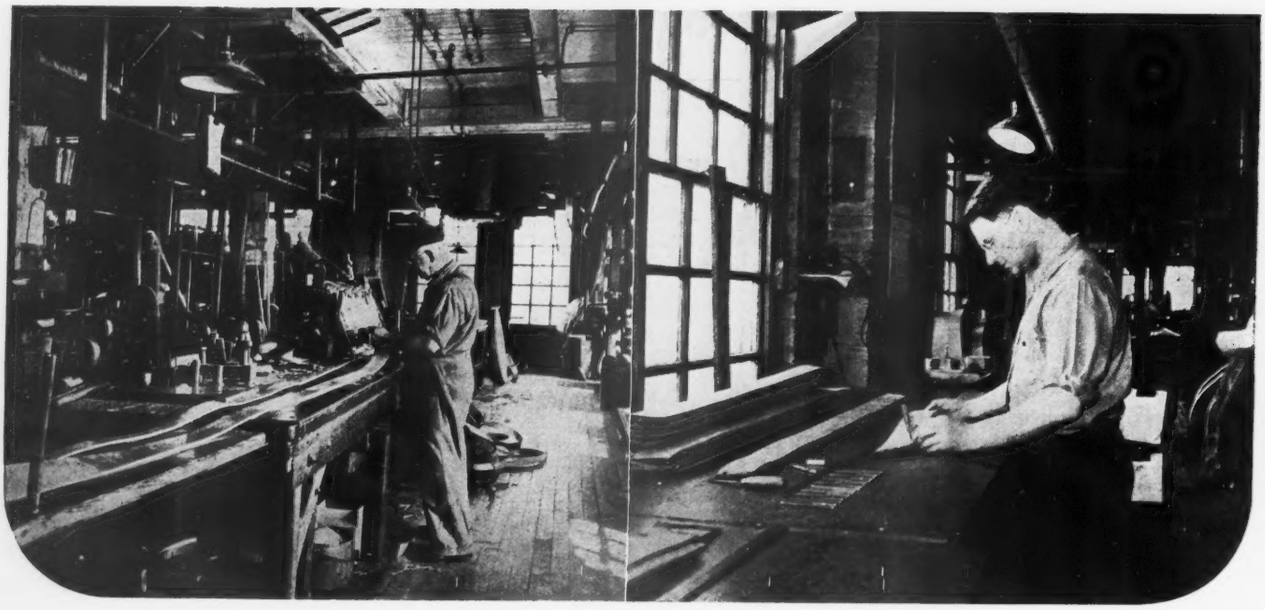
It is this carefully controlled manufacture that makes possible the rare balance of qualities in TANNATE. Like a chef preparing a fine dish—we control the "ingredients".

J. E. RHOADS AND SONS

35 N. SIXTH STREET, PHILADELPHIA, PA.

NEW YORK CHICAGO ATLANTA CLEVELAND

And, this is why you are sure of consistent TANNATE performance: MORE DELIVERED POWER; MORE PRODUCTION; FEWER REPLACEMENTS, and LOWER MAINTENANCE COSTS!



Announcing

A NEW Lightweight Recorder Built Especially for Survey Work

INKLESS
For Indoor or Outdoor Use
Really Portable—Weighs Only 11 Pounds

NOW you can get a portable strip-chart recorder (voltmeter or ammeter) that is specially designed for survey work—General Electric's new Type CF-1. It's an inexpensive, small-sized, accurate recorder that offers these features:

It's Inkless—With no pen to clog and no ink to spill—or "paint" or evaporate or blur—a dependable, legible record can be made at all times. Furthermore, with the elimination of ink, you get successful operation in temperatures as low as −10F and as high as 120F.

It's Lightweight—Type CF-1 weighs only 11 pounds—less than half the weight of usual designs. It's easy to carry, easy to handle.

Portable—For Outdoor or Indoor Service—It's adaptable for wall or pole mounting, and a weatherproof case permits indoor or outdoor use. You can get as much as 30 days of continuous operation without attention—a real feature where frequent servicing is impractical.

Finally, these portables allow you to check circuit load conditions and to make voltage surveys that may lead to new savings. They're built for their jobs, and they're inexpensive.

Complete details of this newest G-E contribution to measurement savings—design features and sample records—are contained in Bulletin GEA-3187. For a copy, ask the nearest G-E office or write General Electric, Schenectady, New York.

SPECIAL Type CF-1 Temperature-compensated Voltmeter

To attain still higher accuracy over a wide temperature range, Type CF-1 voltmeters are available as single- and double-range instruments (rated 0-140 and 0-140/0-280 volts)—with temperature compensation for the 0-140 volt range.

DISTRIBUTION ENGINEERS—Here's What This Means To You

1. Greater precision in recording limits of voltage variation—in spite of adverse temperature conditions.

2. Dependable data with which to make profitable decisions regarding system changes.

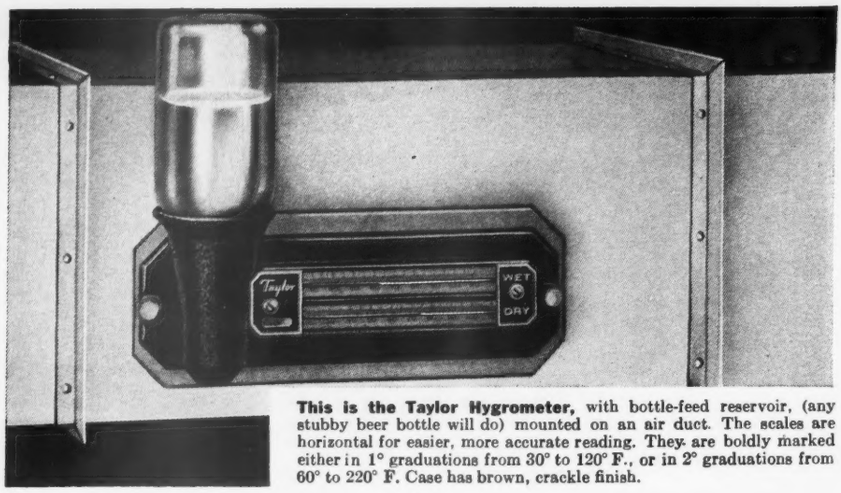
3. Revenue protection—for in low temperatures, where uncompensated units would read high, the increased accuracy from temperature compensation works to protect profits; there's no chance for ill-advised lowering of regulator settings.

GENERAL ELECTRIC

430-140

announcing — NEW TAYLOR HYGROMETER

Read about the exclusive features of this wet- and dry-bulb temperature indicator for air conditioning ducts, dryers, and other closed compartments!



This is the Taylor Hygrometer, with bottle-feed reservoir, (any stubby beer bottle will do) mounted on an air duct. The scales are horizontal for easier, more accurate reading. They are boldly marked either in 1° graduations from 30° to 120° F., or in 2° graduations from 60° to 220° F. Case has brown, crackle finish.

Features at a glance

- ▶ Greater ease of reading because of new tube design.
- ▶ Etched-stem-thermometer rate of response and accuracy.
- ▶ Simplified installation—only one duct opening needed.
- ▶ Instantly accessible for maintenance — unit swings out from mounting plate.
- ▶ Available with bottle feed or constant level water supply to operate under pressure or vacuum.

HERE'S an entirely *new* hygrometer . . . one that is easier to read, install, and maintain . . . one that is *really* in a class by itself! Take a bow, Taylor engineers, for developing a hygrometer with these exclusive features:

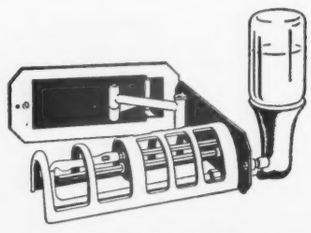
A unique tube design combines in this instrument the accuracy and quick action of an etched-stem thermometer with the rugged dependability of an industrial thermometer. The scale is broad and flat for bold, easily read markings. And these markings are etched on the back of the scale and lacquered over in orange-yellow for maximum, *permanent* reading ease!

High indication accuracy! Inside, a newly designed skeleton-type guard allows free air circulation across both bulbs. Rubber grommets thermally insulate the glass stems, minimizing conduction error and reducing danger of breakage.

The Taylor Hygrometer is easily maintained. All parts are instantly accessible. One filling of the water bottle will last about a week. And if the bottle needs replacing, just substitute a regular stubby beer bottle! That's *another* exclusive feature that gives economical operation!

If air pressure or vacuum exceeds ½" of water, or if you prefer an automatically controlled water supply, use the Constant-Level Reservoir. This is also easily mounted and cleaned. All parts are corrosion-resistant and sturdily made.

There are other features of this Taylor Hygrometer that you can learn about by writing us for more facts. There's no obligation. Taylor Instrument Companies, Rochester, N. Y. Plant also in Toronto, Canada. Manufacturers in Great Britain—Short & Mason, Ltd., London, England.



Swings out easily! All parts instantly accessible in this extremely compact hygrometer! Unscrew two thumb screws and the complete assembly swings out. Required opening in air duct is only 8" x 2¾". Wet and dry thermometers are quickly interchangeable. No danger of breakage during installation, as mounting sub-plate is readily detached from main assembly.

Taylor

Indicating / Recording • Controlling

TEMPERATURE, PRESSURE, FLOW *and* LEVEL INSTRUMENTS

YOU CAN ADOPT ANY OF THE NEW IMPROVED LIGHTING UNITS

WITHOUT RE-WIRING

IF YOUR PLANT IS EQUIPPED WITH BULL DOG Trol-E-Duct*

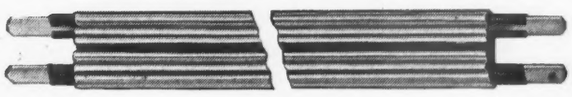
...of the above Lighting Units are ...pended from the Duct and receive ...rent through Trolleys or Twistout Plugs inserted in the Duct.

Haven't you often wished you could adopt, in your Plant, some of the new, modern light sources that are constantly being developed . . . but the thought of delay and expense for RE-WIRING, made you hesitate?

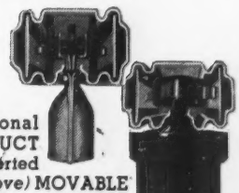
How different the picture if your Plant had a flexible TROL-E-DUCT Busway System of lighting distribution. Then you could readily avail yourself of these better lighting units and keep your lighting system modern—always—WITHOUT the delay and expense of RE-WIRING . . . For every inch of TROL-E-DUCT is a potential receptacle into which, by means of movable Trolleys or semi-fixed Plugs, ALL types of lighting fixtures may be readily connected for current . . . And the Lights can also be readily moved to new locations at any time, to meet changes in Plant layouts or requirements.

TROL-E-DUCT is available in 5-FT. HANDY SETS (for less than $4.00) or as a complete pre-fabricated wiring system of any desired footage.

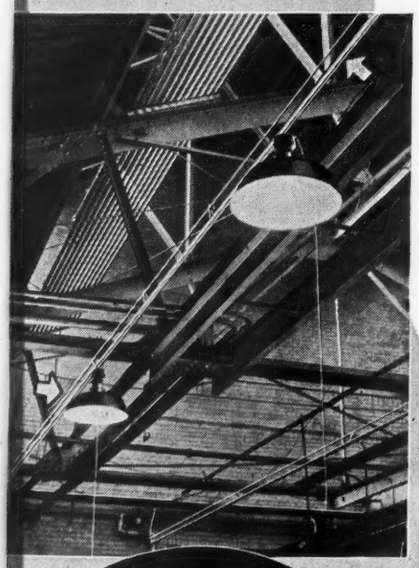
Isn't there some spot or department in your factory right now where you should use this flexible lighting system that gets you the kind of light you want—where you want it—when you want it . . . all at a minimum outlay?



STANDARD DUCT SECTIONS can be coupled together to form a continuous run of any length. Auxiliary fittings such as Hangers, Elbows, Couplings, etc., provide a complete pre-fabricated wiring system—mobile and flexible.



Cross-sectional view of DUCT showing, inserted therein, *(Above)* MOVABLE TROLLEY and *(Right)*, a semi-fixed TWISTOUT PLUG, to which all types of lights can be readily connected for current.



★ *The* MODERN BUSWAY LIGHTING SYSTEM . . . . provides *FLEXIBLE Electrical Layouts—at Minimum Financial Outlay*

Call your local Bull Dog Jobber or write for illustrated Bulletins

BULL DOG ELECTRIC PRODUCTS COMPANY

ORIGINATORS OF FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS FOR LIGHT AND POWER

DETROIT, MICHIGAN

BULL DOG ELECTRIC PRODUCTS OF CANADA LTD., TORONTO, ONT.

ADEQUATE WIRING SERVES SAVES

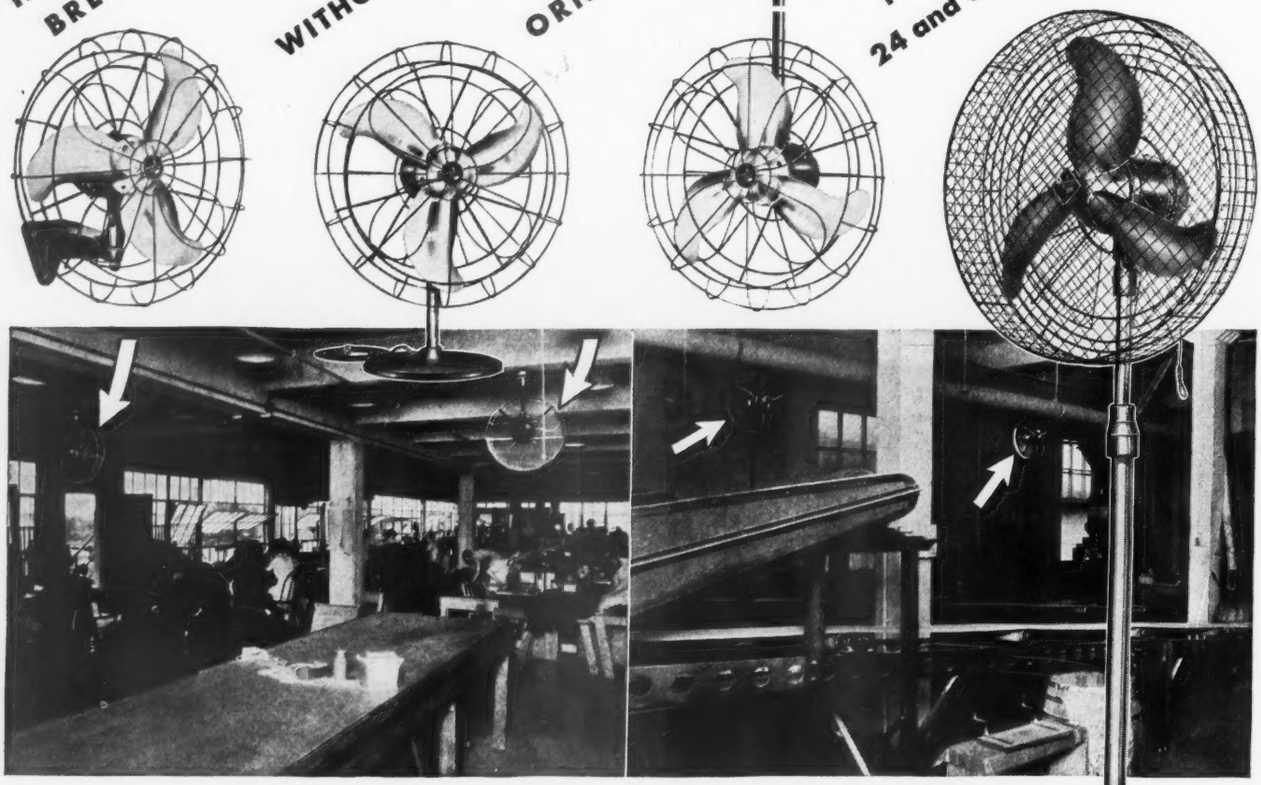
...nufacturers of *Vacu-Break* SAFETY SWITCHES, PANELBOARDS, SWITCHBOARDS, DUCT SYSTEMS

HIGH VELOCITY BREEZE PENETRATION

6,000 HOURS WITHOUT RELUBRICATION

MESH OR ORNAMENTAL GUARDS

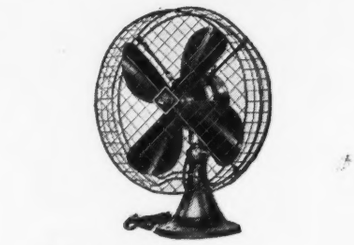
1-SPEED and 2-SPEED 24 and 30-in. FANS—AC and DC



For More Productive MAN HOURS, *Install* EMERSON-ELECTRIC *High Velocity* AIR CIRCULATORS *and* EXHAUST FANS

Here's the way to step up production through the hot summer months that your workers will applaud and appreciate. Put Emerson-Electric High Velocity Air Circulators in behind that excessive heat, stagnant air or nauseating odor—and watch it disappear—workers become more congenial, contented, and efficient.

Emerson-Electric Air Circulators are available in seven models, each with adjustable floor, counter, wall or ceiling mountings. Heavy-duty, grease-packed, ball-bearing motors, give 6,000 hours (3 average seasons) of continuous service without re-lubrication. Complete or spot installations can be made quickly. Write today for Emerson-Electric Bulletin No. 248.



EMERSON-ELECTRIC Power-Duty Exhaust Fans 12 to 48-Inch, *Exhaust up to 16,800 Cu. Ft. Per Min.!*

Emerson-Electric Exhaust Fans remove excessive heat, steam, fumes, quickly, effectively. Eight sizes—2-speed ball-bearing, single-speed sleeve-bearing and single-speed, belt-driven models. Automatic outside shutters for all sizes. Write today for booklet, "How to Select Emerson-Electric Exhaust Fan Equipment" No. 249.

Factory Safe

16-Inch Parker-Blade Non-Oscillator with Wire Mesh Safety Guard

Equipped with Capacitor Motor which cuts current costs 24%, this powerful 3-speed factory safe fan is capable of delivering a large volume of cooling, penetrating breeze, economically. Backed by the famous Emerson-Electric 5-year factory-to-user guarantee. Write today for new 1939 Emerson-Electric Fan Catalog No. 314.

163

EMERSON ELECTRIC

MOTORS — FANS — APPLIANCES

ST. LOUIS • • CHICAGO • • NEW YORK

Cut Your Tool Costs As Ritter Dental Does

And Speed-Up With

McCASKEY TOOL CONTROL

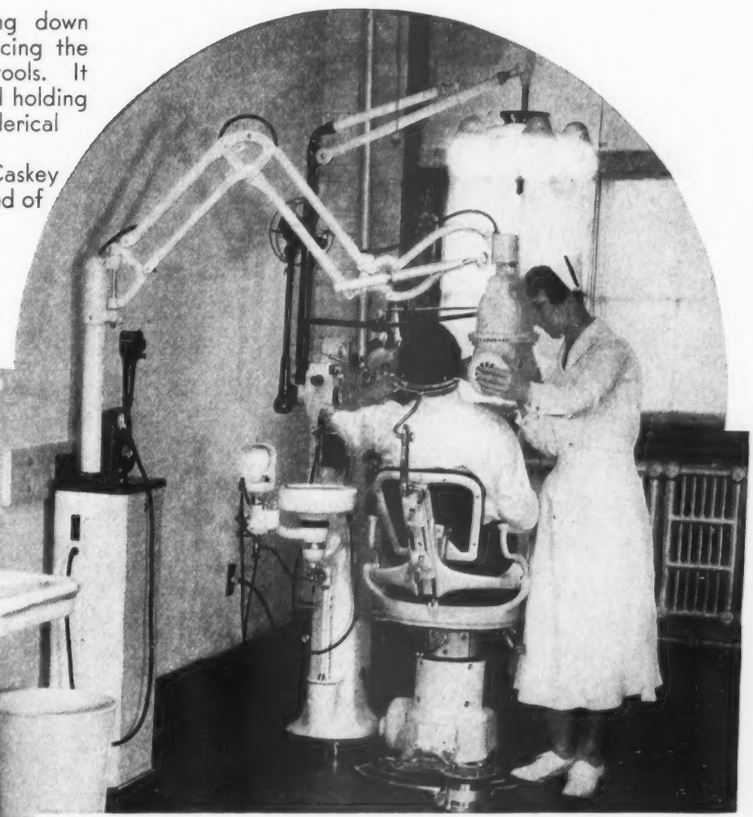
★ **The Ritter Dental Manufacturing Company, Inc., Rochester, N. Y., has reduced tool costs and improved tool service with McCaskey Control, and you can too.**

Read the comments of Mr. Charles E. Codd, Master Mechanic, on the effectiveness of McCaskey methods in the Ritter Dental plant where all types of dental equipment, including X-Ray units, dental chairs, sterilizers, etc., are produced:

"In January 1938, we replaced our old tool check system with McCaskey Tool Control. The loss of tools stopped immediately and so did all disputes about getting back the same tools loaned to employees. These and other savings have resulted in reduced tool costs.

"McCaskey Control has helped in cutting down breakage and improving crib service, reducing the time required for drawing and returning tools. It also includes a positive means of cutting and holding down the crib inventory without a lot of clerical work.

Supplementing our crib control, we use McCaskey methods in notifying all departments concerned of hold-ups resulting from repairs and alteration of machine tools, jigs, fixtures, etc., as well as advising when they again are available for production. This is accomplished with an extremely simple system."



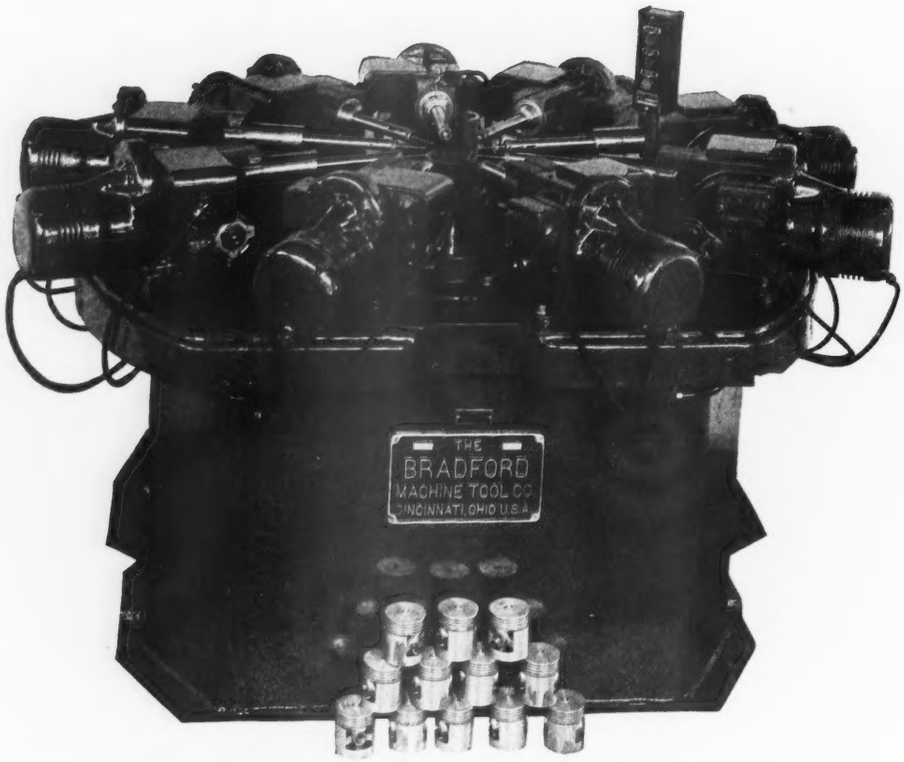
Factory Hospital Completely Equipped with Modern Ritter Dental Equipment.

★ **Let us send you the pamphlets, "A Modern Tool Control System in a Modern Plant", and "No Lost Tools Any More", providing more detailed data on the results achieved with McCaskey Tool Control in two other representative plants. Or, without obligation, let us have a representative outline McCaskey methods for your specific needs. Write today.**

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL



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. . . each accurate, round and true

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Each of the nine drill spindles, turning at 5100 R.P.M., are held rigidly, accurately and permanently by these precision spindle bearings.

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While your new machine is in the blueprint stage, be sure to call in a New Departure engineer to work out the details of bearing application. The vast experience of New Departure engineers, freely at your disposal, will save you time and money and assure you of the utmost in bearing performance.

New Departure, Division General Motors Sales Corporation, Bristol, Conn. Detroit and Chicago.

2761

FACTORY
MANAGEMENT and MAINTENANCE

L. C. MORROW, Editor

Steady Jobs Will Help Make Profit

INDUSTRY IS GOING TO DO MUCH MORE about employment stabilization. And is going to be glad to do so because of the good effect on net profit.

Everyone will admit the stabilizing influence upon product demand when wage earners have steady jobs. So the effect of this factor upon net profit is mentioned merely because it belongs in the analysis. Nevertheless, it must be classified as an important effect.

Layoffs are costly after the wage earners go back to work. Some companies know—and others don't, of course—that production per man-hour is likely to be much lower than normal for weeks after people return from a period of idleness. Even on jobs requiring relatively little skill it takes time to get into the swing of producing. The effect of this factor upon net profit is important.

Factor number three is the cost of starting and stopping production equipment, and the waste of services. Here costs are involved that tend to disappear as operation is regularized. This factor, also, exerts an important influence upon net profit.

A fourth factor is the tendency of uniform operation to bring about an optimum investment in plant and equipment. The farther apart the extremes of operation, the greater the capital investment must be, because enough plant and equipment must be supplied to take care of the greatest peak in operation. This factor, too, is important.

We don't know all the methods that will be used to stabilize employment. It's a safe prediction that many of them haven't been devised. A few we can give. They are plans that have worked.

One method, a common one, is to introduce into the plant a product or products that will offset products manufactured to fill a seasonal demand or because the raw material from which they are made is available only in season.

Another is the manufacture for inventory, during slack periods, of complete products, or of product parts in the making of which much labor is required.

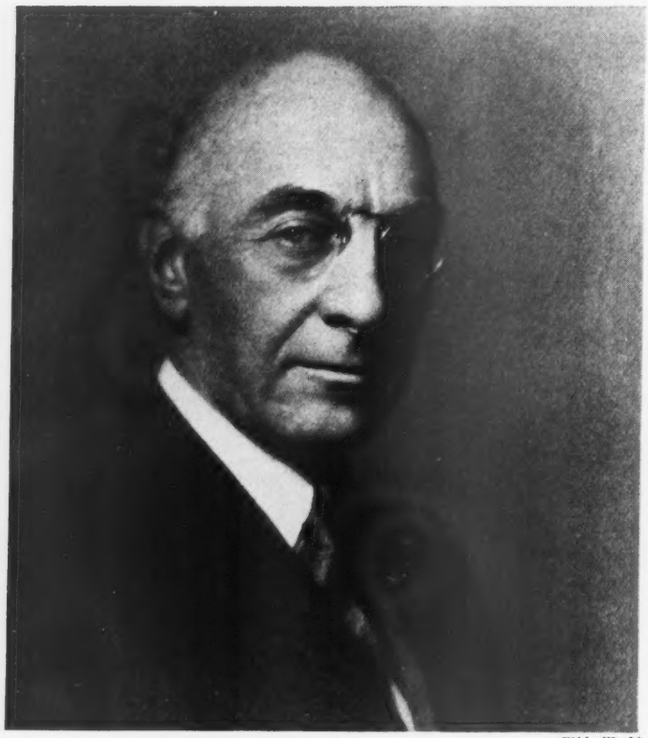
A third is the use of a flexible work period, with a great spread between maximum and minimum hours per day or per week, when fluctuations in supply of raw material are short and violent.

A fourth is the use of research (followed by promotion) to discover and exploit new uses for the product so that there will be reduced periods of low customer demand.

It would be well enough if the attempts to stabilize employment were made upon purely humanitarian motives. That isn't necessary, though. With this problem, as with almost all others that industry encounters, it is safe to approach it from the angle of self-interest. It will be found to more than pay for itself.

L. C. Morrow

INDUSTRIAL HEALTH



Wide World

DR. VICTOR G. HEISER, for a man who went through all the motions of retiring five years ago, is a very busy citizen today.

He thought he was ready to rest when, after 35 years of world travel, first as Health Director of the Philippine Islands and then for 20 years as director of the Rockefeller Foundation's medical interests in the near and far East, he retired in 1934 and settled down to write his memoirs.

But the truth is that Dr. Heiser just doesn't know how to rest. So when the National Association of Manufacturers urged him to take on a big new job here at home, he readily agreed.

Meanwhile his book, "An American Doctor's Odyssey," had proved to be one of the great human interest stories of all time. It is the romantic record of a man who made sixteen trips around the globe to "sell" health practices to millions who had never heard of such things before. With rare determination and diplomacy, he persuaded kings and emperors, merchants and manufacturers, generals and statesmen of the economic advantages that healthy peoples enjoy.

Not so much by healing the sick as by teaching people how to keep well, he waged effective war on cholera, smallpox, hookworm, leprosy, and malaria throughout the Orient. The Philippine Health Service, in its early years under his administration, cheated death of 50,000 victims a year; in time it trebled this figure.

"All my life I have tried to do things in a practical way," he says, "and not be carried away by ideals. It has been my privilege to help industry all over the world to make a profit out of medicine, not only to get dividends but to improve the lot of the worker."

Despite his travels, Dr. Heiser is by no means a complete stranger to the American industrial scene. Over 20 years ago he advised American cities on health programs and drew up the outline for the Massachusetts state health law. With Dr. W. Gilman Thompson he established the Reconstruction Hospital in New York for research and modern treatment of industrial accidents and disease. He also made the original plans for far-flung medical service of Standard Oil of New Jersey.

Dr. Heiser began his NAM assignment with a study of American industrial conditions. He believes that the sums already spent profitably for health by large industries, and the information gained therefrom, can be turned to the advantage of the smaller companies and that the attack on industrial illness can thus be made more uniform. The NAM Committee on Healthful Working Conditions has become a clearing house, supplementing the work of other established agencies, for the exchange of information on health problems among employers.

Dr. Heiser is assisted in his present work by Dr. Donald M. Shafer, Associate Consultant to the Committee.

DR. VICTOR G. HEISER

Consultant to the Committee on Healthful Working Conditions
National Association of Manufacturers
Author of "An American Doctor's Odyssey"

INDUSTRIAL MANAGEMENT fights loss as the medical profession fights disease. Loss, as I understand it, is one of the diseases of industry. It increases costs, decreases production, and retards employment. I imagine that a problem in loss prevention must present to the management man some of the same nerve-tingling challenge that a doctor feels in approaching a difficult case.

Well, here is a challenge to America's industrial management. Each year this nation, with its well-managed, carefully maintained, highly efficient industrial machine, takes a loss of $10,000,000,000 due to illness and accidents. Industry bears a heavy share of this load. The life span of wage earners in certain industries is seven years below the average. Wonders have been worked in infant mortality and child health. But the life expectancy of adults has improved but little in recent decades.

Now obviously a $10,000,000,000 loss is something to reckon with in terms of its effect on the price of consumer goods, on sales and production, if we view it in no other way. Like hidden taxes, a good part of this loss is hidden, too. Unlike taxes, the problem does not lie wholly beyond management's control.

The Largest Factor of Loss

Would you like to examine this problem? Get out your pencil. Let's talk it over. Here are some notes I should like you to take:

First. It is a mistake to consider the industrial health question solely in terms of accidents and occupational hazards. Of course one can't very well overestimate the importance of plant safety. But you, as management men, are naturally looking for the *largest* factor of loss.

Then here is a notable fact. *Only 10 per cent* of industrial absenteeism is due to accident and occupational disease. The remainder we must lay to such things as common colds, pneumonia, heart disease, and all the other ordinary ailments of man.

—for People and for Profits

Here is a challenge to the manufacturing industries, which bear the brunt of America's $10,000,000,000-a-year health loss. Illness, not accident, is now the big problem. Health programs cut costs, increase efficiency, boost morale

The comparatively low percentage of accident and work-hazard loss is undoubtedly due to the fact that these matters have received so much attention. Compensation laws have underlined the necessity for plant safety programs. Beyond that, industry has done much voluntarily to educate and protect workers against accident.

I mention this because it demonstrates that such a problem will yield dramatically to a well-organized and intelligent attack. So, too, will the larger if less tangible problem of common disease.

Plant safety programs have proved profitable to management.

Industrial health programs are likewise a paying proposition.

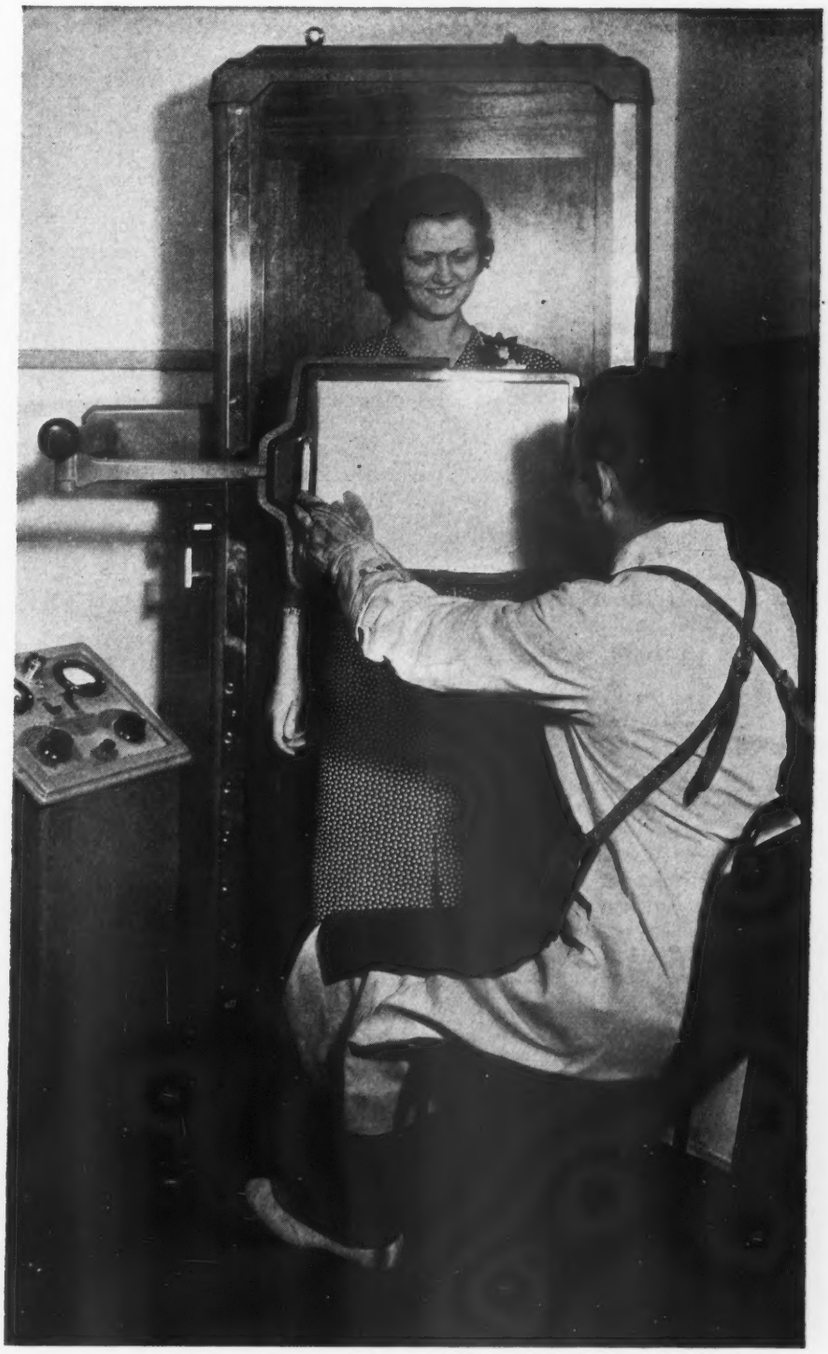
What does an industrial health program mean? Essentially it is the provision of healthful working conditions. Such conditions are measured by the adequacy of these factors: industrial medical services, sanitation, lighting, heating, ventilating, safety.

Here is another item for your notebook. In my capacity as consultant to the National Association of Manufacturers Committee on Healthful Working Conditions, I recently examined a survey which showed that probably 80 per cent of our really *large* industrial establishments have made some measure of progress in health work. Many have gone well beyond minimum standards.

But in the plants other than the relatively few big ones, which for this purpose we shall define as those having 500 employees or less, we found few that had even installed medical services.

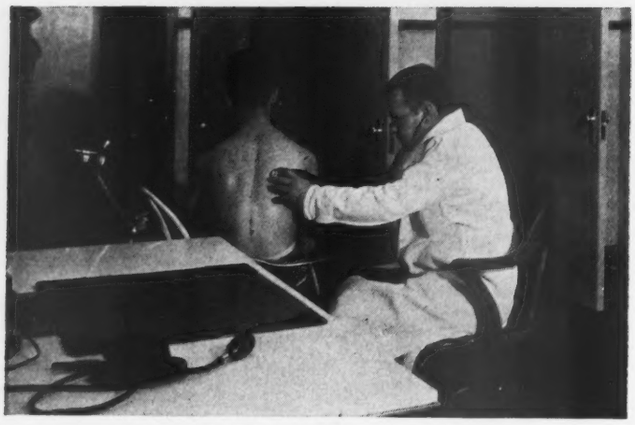
"Well, that's not so bad," you may say. "If the big plants have progressed so well, the smaller ones will follow along eventually. Anyway most industrial employees work in big plants. So the problem is already more than half solved."

Not so. Nearly 62 per cent of our industrial wage earners are employed in plants having 500 or fewer employees. The real job has only begun. This means, too, that the 500-and-under



PHYSICAL EXAMINATIONS, like those given by Westinghouse (above), pay big returns; here the fluoroscope is used as a visual check-up on an employee's general health

What Health Means to Industry



Each year this nation, with its well-managed, carefully maintained industrial machine, takes $10,000,000,000 loss from illness and accidents. Industry bears a heavy share of the load

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Only 10 per cent of industrial absenteeism is due to accidents and occupational diseases. The remainder we must charge to common colds, pneumonia, and all the other ordinary ailments of man

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Plant safety programs have proved profitable to industry. Health programs in industry are likewise a paying proposition

•

Probably 80 per cent of our largest industrial establishments have made some measure of progress in health work. But of plants with less than 500 employees, few have installed medical services

•

What are the gains? Reduced absenteeism, quicker recovery from illness or injury, lower death rates, lower accident rates, lower labor turnover, greater efficiency, better employee morale

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plants are bearing the larger share of the load, a point which the managers of these plants should take to heart.

Now we have completed our preliminary statement of the problem. We know the loss.* I have said that, from wisely expended health dollars, profits are sure to accrue.

What are the gains? They are many and varied, tangible and intangible. All the wit and wisdom of man have so far failed to devise a yardstick by which we may say flatly: "So many dollars, expended in just such a way, will yield an immediate saving of exactly so many dollars." The audit of these benefits depends on *what you have already* and on the value you place on the several items of return.

We do know, for example, that where plant medical services exist, employees recover much more rapidly from illness or injury and are much less likely to suffer permanent disability. (In dollars and cents, how much does an illness or accident cost you in idle-machine time, replacement of workers, compensation, transfers? There's one saving.)

And we do know that healthful working conditions bring lowered accident rates. A survey by the National Metal Trades Association showed that in a representative group of plants the installation of medical service cut accident rates 46.6 per cent, with a 28.7 per cent reduction in compensation payments and a 50.6 per cent reduction in absenteeism. (What do accidents cost you? What would *you* save?)

We know also that healthful working conditions result invariably in lower turnover, lower death rates, and greater efficiency. The last is affected by many different factors, of which lighting is one good example. Research has shown that an average of 87 per cent of an industrial worker's motions are guided by his sight. Yet a survey of 3,000 plants in 22 states, found the average of plant light intensity about 50 per cent below standard. In 38 plants where better lighting was installed, a 13 per cent increase in efficiency resulted.

Walking Advertisements

Now we enter the intangible field of public and industrial relations. Sick workers are likely to be discontented workers. On the other hand, there is no way in which management can express its interest in employee welfare so convincingly as through a concrete program for employee health protection, sanitation, and comfort. And every wage earner convinced, becomes a walking one-man advertisement for his company.

My work of the past year has taken me to a great many industrial cities and into a great many plants. I am, by the way, a wanderer, returning to these shores after many years abroad. Some of the things in industry that are familiar to you seem fascinatingly new to me.

And I have noticed this: In every community the employing companies that are most liked, most respected, and, of course, most free from strife, are those that have done the most in health work.

Now here are a few practical examples of plant health policies that have proved to be pure gold for all concerned.

A veritable classic is the tale of Youngstown Steel's famous inquiry into the wonder-working properties of beer. Heat strokes, which so often strike men down at the maws of blast furnaces, were causing heavy loss. Indus-

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* It is difficult for the individual management to itemize this loss. The methods of auditing it differ. The Travelers Life Insurance Company has estimated that the hidden losses from accidents are four times the cost of compensation and medical care. The National Safety Council places the average cost of compensable accidents at $425, with indirect costs three to four times as large. Few plants keep records on the costs of illness, however, until after they install health services, which makes comparisons doubly difficult in this field. One of the best records of such loss was kept by a Connecticut firm employing 4,500 persons, which found that it sustained $267,000 yearly *direct* losses (in idleness, replacement of workers, transfers, and impaired efficiency) while its employees and the community as a whole suffered additional indirect losses of $303,000.

trial health specialists were called into consultation. One of the first things they noticed was a legend, current among the men, to the effect that beer drinkers were immune to heat stroke.

There was nothing about the known qualities of beer to justify such a conclusion. Yet the statistics appeared to support it. The investigators then traced the beer drinkers to their haunts. And they found that most of the men were shaking salt into their beer, while munching copiously salted pretzels.

Concurrent researches had shown that intensive perspiration destroys the salt balance in the body. Large drafts of water dilute the salt content of the bloodstream still more.

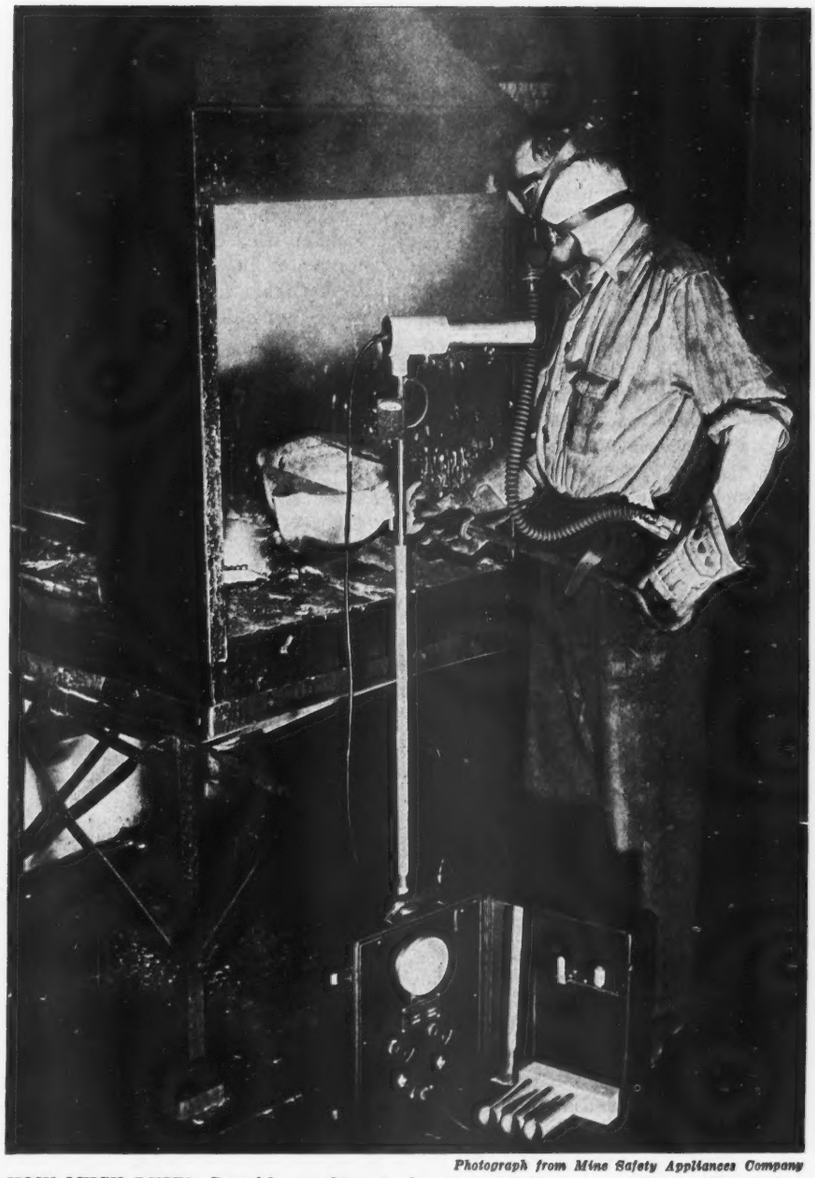
The conclusion was obvious. The men were given regular doses of salt, and heat strokes ceased to be a problem. The discovery saved Youngstown thousands of dollars and provided industry with information worth millions.

Another profit-and-loss statement. An Eastern plant employing 200 men was at times seriously undermanned and was losing production heavily because of the prevalence of common colds. An adviser recommended the use of unit heaters which raised the temperature 20 degrees. Yet this was sufficient to lower absences due to colds from 44 a week to a reasonable figure of 2 a week. The cost of the heaters was in no way comparable to the previous loss.

$14.40 per Employee

An Ohio machine and woodworking plant employing 115 men installed a medical dispensary at a cost of $600. The additional outlay for supplies and medical service amounted to $1,660 per year, a net cost of $14.40 per employee. The result was an immediate direct saving in absenteeism of $3,420. Labor turnover was reduced 25 per cent. And the record shows that no major accidents occurred thereafter.

On the efficiency side, health work pays other dividends. I recall the case of a plant engaged in making porcelain sheets for use by manufacturers of refrigerators and kitchen goods. There was, it seemed, no such thing as just one shade of white porcelain. Despite the utmost care, the product would come out in dozens of different shades. The plant was taking a large loss in rejections for which there seemed to be no solution. Specialists were called in. The eyes of all the employees were carefully examined and only those with the best sight were allowed to work as color matchers and inspectors. Still the trouble persisted. Then it was pointed out that the eye's ability to detect color differences depends on its capacity to synthesize "visual purple" and that the visual purple content of the eye depends on the supply of Vitamin A in the diet.



Photograph from Mine Safety Appliances Company

HOW MUCH DUST? Portable machine in foreground takes a scientific sniff at plant atmosphere, detects dust and fume dangers, warns of need for protective equipment

Inspectors and color matchers were given foods and concentrates with a high Vitamin A content. *Rejections were reduced 75 per cent.*

Here is a case of another sort. In Baltimore, lead poisoning cropped up rather suddenly as a health menace in the poorer neighborhoods near the city's industrial section. It was puzzling because it appeared to occur among employees of plants where no lead hazard existed. It affected the families of the workers as well as the men themselves. Plant physicians and public health officials finally traced the trouble to a storage battery plant which was in the habit of dumping old battery boxes on unused land. Most of this material, with its high lead content, was being carted home to burn in stoves and open fireplaces. The dumping was stopped, and the mysterious lead poisoning ceased at the same time.

Of course, there are many public health hazards with which industry is powerless to contend. No amount of industrial health service is going to prevent Joe Jones from going home and catching influenza from his neighbor over a game of pinochle. Once Jones leaves the plant he is in that sense a public problem. But *in* the plant he is a management problem. The mutuality of this is apparent. If Jones brings his germs back to the plant, where they remain undetected

for a time, then other Joneses will be made ill and will take the disease out into the world again, possibly to be distributed to wage earners in other industrial plants.

In other words, industry can't take on the whole public health job, but it does have a definite part.

Unfortunately, I can't lay down for you a specific program to be applied to your plant. It depends on the size and hazards of each individual plant. In general, I can tell you that every plant should have a properly organized medical service. This should include a full or part-time physician or physicians, as needed, skilled in industrial practice according to the standards of the American College of Surgeons. Your staff men should have available to them the services of expert consultants. They should have equipment for emergency and dispensary work plus the necessary personnel. The selection of a qualified nurse is very important.

The Value of the Nurse

Like the American College of Surgeons, the nursing profession has shown its understanding of the growing importance of industrial health work as a specialty in itself. Some valuable work is being done toward the exchange of information and the standardization of practice by such units as the New Jersey, New York, and Philadelphia Industrial Nurses' Clubs and the New England Industrial Nurses' Association. These groups now hold joint conferences annually. Through their work, management is also learning to appreciate the value of the nurse as a factor in harmonious industrial relations.

Once set up, your medical department functions effectively in your behalf and, of course, cooperates closely with private physicians in the care of the individual employee. It keeps accurate health records to guide it in detecting and correcting promptly any important variation from the customary and normal procedure.

The medical department also stands at the door of your plants to see that the new man fits the job and the job fits the man. This can help to ward off accidents initially. Twenty-five per cent of all workers are "accident prone," according to Dr. Leverett D. Bristol, Health Director of the American Telephone & Telegraph Company; Dr. Bristol's studies have shown that the "accident prone" are prey to minor psychological disturbances which make it unwise to employ them in hazardous operations.

Going further, your medical service should administer periodic physical examinations. This is, I admit, a delicate question. Employee opposition arises frequently (you know how you, yourself, are inclined to shy away from such things), yet the examinations are, when fairly administered, for the employee's own good. The practice can be established by honestly showing the men its advantages to them. Care must be taken that physical examinations are never used *against* the employee, however, or the whole health project will inevitably fail.

In its surveillance of lighting, heating, ventilating, sanitary and safety equipment, your medical department serves as a sort of monitor, acting in cooperation with your personnel, production, and maintenance managers wherever its work touches theirs. If the records show, let us say, a too-great prevalence of bronchitis in the shipping room, the medical director seeks the cause which, in this case, may prove to be faulty ventilation. His recommendations then become a matter for management to act upon.

"Very well," some of you may say, "but that's big-plant stuff, isn't it?" *Is* it? Then one may as well argue that efficiency itself is strictly a big-plant matter, that small plants can't afford it. True, the cost of medical service still runs about two-thirds higher in small plants than in large. This difference can, I am confident, be greatly reduced. Our NAM Committee has addressed itself to this problem and we are working now on plans to enable small plants to obtain the equivalent of big-plant health protection at the same unit cost.

I know also of many instances in which small plants have formed groups to pool the cost of health projects with great resulting economy. Here is something in which you, if you happen to be concerned in small-plant management, can take the lead. You may see a chance in your community to interest the management of neighboring plants in a joint health program. I urge you to do so. The formation of a committee would be a logical first step. You will find the insurance companies, the American College of Surgeons, and the governmental agencies willing to survey your establishments and make recommendations without in any way

UNION VS. TUBERCULOSIS

Health-conscious members of the New York Furriers Council undergo X-ray examinations at union headquarters. For economy a machine that makes 150 X-rays an hour on roll film is used. Many unions are developing group health programs

Wide World

attempting to enforce their suggestions.

Also, by all means, take a greater interest in the public health work of your community. Go at it in the same mood in which you would check up on your police protection if your city were suffering from a crime wave. Modern health service can be had for the average city at $2 to $2.50 per capita annually. Most cities spend far less on this vital work. Yet the burden that an inadequate public health system lays on local industry is much greater than any tax increase needed to supply the difference.

I have outlined, I believe, the essential steps in management's health job. Let us consider now the *ideal* health program toward which industry should strive and toward which, incidentally, a large sector of management is already working.

Despite the best of plant medical service and working conditions, some employees are going to become ill, anyway, from causes not covered by compensation.

And Joe Jones, sick, represents a tragic element of loss not only to industry but also to the community. He loses his income. His family loses its support. His savings, if any, are soon exhausted by living expenses, hospital and medical care. At best he runs into debt, at worst he goes on relief. Worry retards his recovery. He tries to return to work too soon, risks permanent impairment to his health. In this condition he is prone to accident. And I imagine that he gets into a frame of mind that makes him easy prey to agitators of one sort or another.

The Cost of Replacing Joe

Meanwhile, his employer has taken a loss, too, in the cost of replacing Joe and in Joe's reduced efficiency upon his return. If the man next to Joe in the plant came down with the same disease, the loss is doubled. There's a broader loss also to industry as a whole. Just think of the industrial plants that are not going to sell any washing machines, vacuum cleaners, or candy to the Jones family for a long, long time to come.

The ideal answer is any plan that will keep the Jones family a debt-free, self-sustained, consuming economic unit throughout Joe's illness. Not only that but there must be some way of providing hospitalization and medical care for Joe's family as well.

Much is being done in this direction. We have group insurance plans, company sick benefits, and employee mutual aid associations to provide for loss of income during illness. Group hospitalization plans are coming rapidly to the fore. It is expected that by 1942 some 10,000,000 Americans will be enrolled in them.

Management can encourage and initiate these things. It is widely agreed, however, that the best and most successful plans are those supported *wholly or in large part by employees*, although some initial financial assistance may be needed.

In the ideal set-up, income protection and hospitalization are not quite enough, however. One large, serious gap remains. That is the question of medical care during the period of illness. This is being met in some quarters by group health associations, comprising bodies of 2,000 employees or more. Groups of this size can support full-time clinics, fully equipped and staffed. Some labor unions have developed similar plans. Abroad, compulsory group health insurance is being practiced in several forms all looking toward the protection of the worker from loss of income and the provision of hospitalization and medical care.

No final solution to this problem has yet been advanced in this country. Our organized medical bodies are wary of group health associations, believing that through them the control of medical policy and of the hospitals may pass into lay or political hands. That is a real danger, of course. Yet some way must be found to free the Jones mind of this worry and at the same time take the burden of caring for impecunious Joneses off the hands of generous physicians. The average doctor, you know, has to charge off between 25 and 50 per cent of his nominal income to charity. All he gets is an income tax exemption, if he is fortunate enough to have an income big enough to be taxed.

The answer to this question, when it does come, will result, I believe, from a meeting of the best minds in medicine, government, *and* management. Meanwhile I see signs that management is becoming alert to the need for a well-rounded health set-up protecting its employees, in and out of the plant, from illness and its consequences.

In the course of 35 years in public health work, spent largely in the Orient but involving 16 trips around the world, I have met men of many kinds, in high places and in low, and many of them have been indifferent or actively hostile to the health principles I sought to promote. I have had to deal with ignorance, prejudice, superstition and selfishness, and I learned early that the best appeal—whether addressed to the ragpickers of Egypt, the Chinese merchants of Manila, or the plantation owners of Ceylon—is self-interest. I have tried to do things in a practical way and have tried not to be carried away by ideals. It has been my privilege to help industry all over the world to make a profit out of medicine not only to get dividends but also to improve the lot of the worker.

Efficiency Through Health

It is only recently that I have come into close contact with the American manufacturer and he is, to me, as new and strange as any of the men I have met abroad—because he is so different, so progressive.

American industrial management recognizes not only the practical but also the humanitarian necessity for a broader health program and better working conditions. Everlastingly impressive to me is the generosity of the industrialists I have encountered on our NAM Committee, their eagerness to share with other managements the benefits of their own experience and the fruits of their own expenditures in plant economy and efficiency through health work.

I am therefore emboldened to predict that before long American management will be among the leaders in employee health protection.

"Untouched by Human Hands"

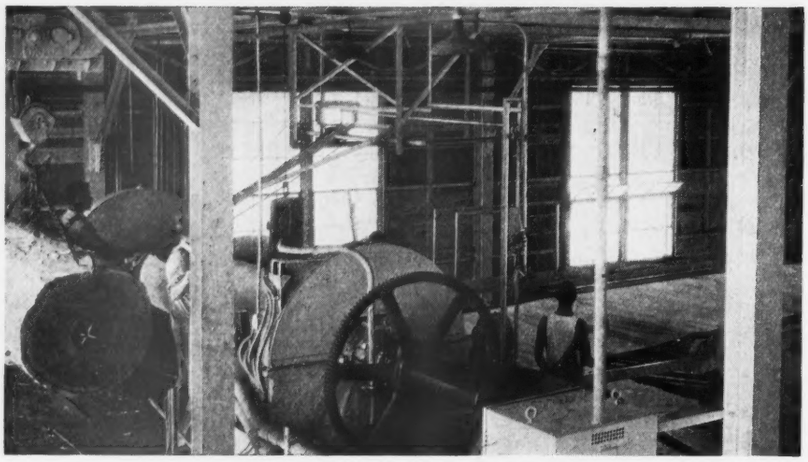
Too bad this frequent boast of the food industries cannot be more generally made—for it's one that's invariably sung to the pleasant tune of profits. For instance, here's a mill that makes veneers—makes them better and at lower cost because the process has been mechanized

ARTHUR VAN VLISSINGEN
Consulting Editor

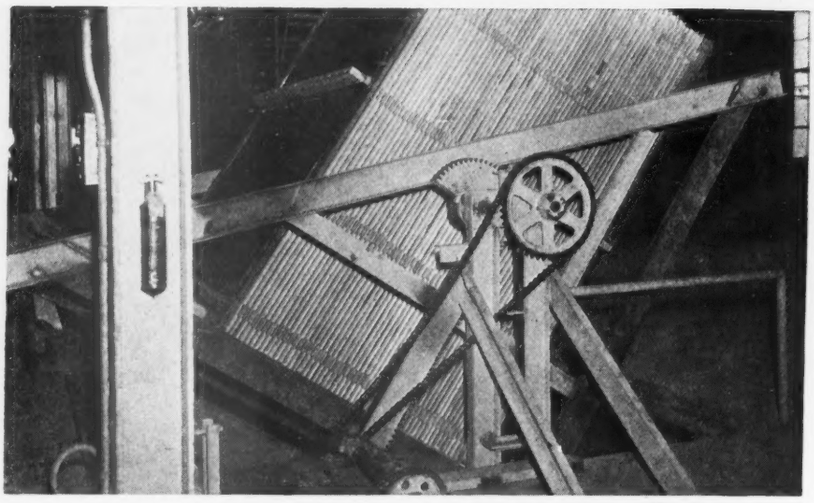
1 An ingenious application of a portable tool to a job that otherwise is done neither so well nor so rapidly, is seen just prior to putting the log on the peeling lathe which will cut it into veneer sheets. Standard practice in veneer mills is to place the chuck at somewhere near the center of the log and start peeling. If the centering is inaccurately done, then a larger share of the log is peeled away in useless trim before the knife gets down to the place where it can be in wood all the way around.

In the new plant of Meyercord Compound Lumber Corporation, Mobile, Ala., just before the log is placed in the peeling lathe, it is centered by the man in charge of the operation. He brings a portable drill, looks at each end of the log, sinks a hole at the center. The chucks on the lathe are equipped with guides to help find these holes. The speed of the operation has been doubled. The lathe is actually producing veneer in a fraction of the time formerly consumed in the preliminary peeling. And the waste has been greatly reduced.

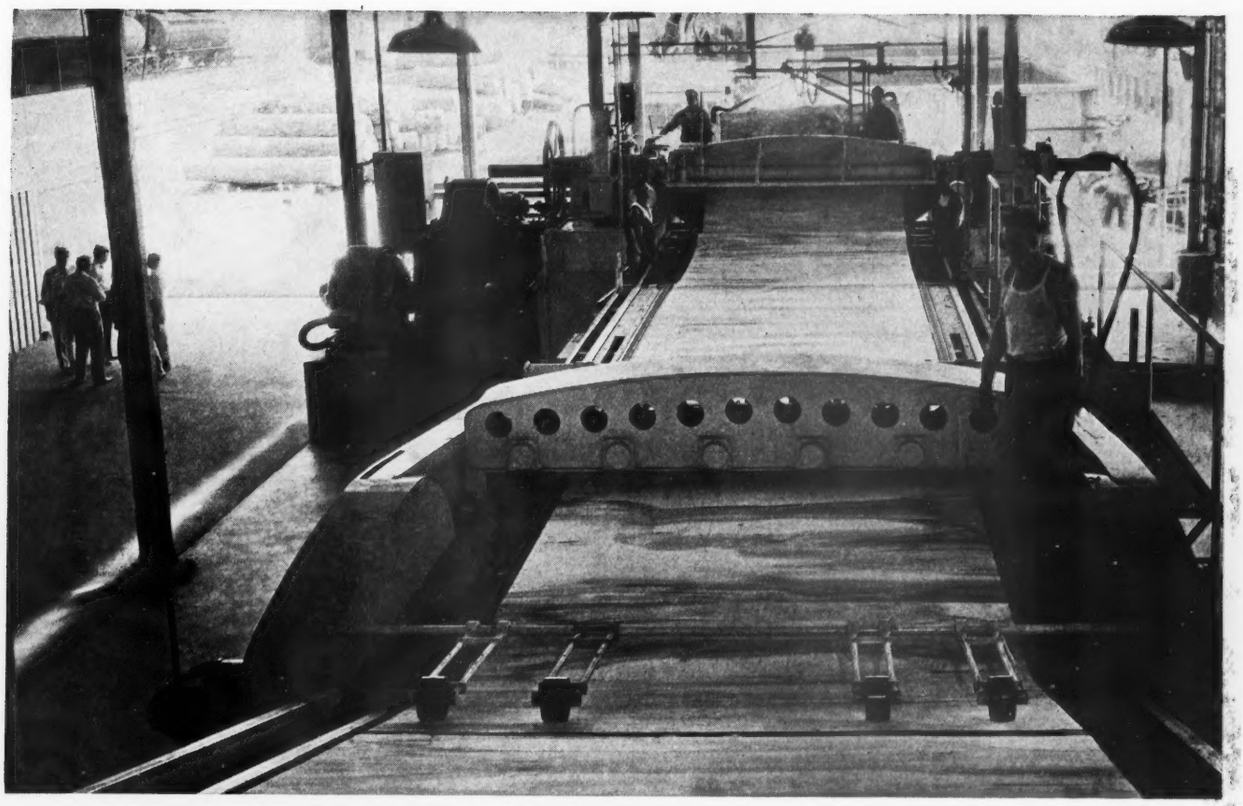
2 To accommodate the cutting edge to the contours of the material being cut is often a problem in an operation where the material by its nature cannot come in entirely uniform cuts. The method used for this purpose in the new Meyercord veneer plant accomplishes the result so well that it gives a sheet of remarkable uniformity, with a consequent improvement in quality. The knife itself is made of thin, pliable steel. Instead of being anchored rigidly to a plate, it is suspended on heavy coil springs at intervals of a few inches. The tension of these springs can be individually regulated. If a sheet of $\frac{1}{8}$ inch is needed, it is only necessary to set the springs at the pressure that will yield this thickness. The log, turning in the peeling lathe, is wet, and unavoidably it sags. The springs accommodate the cutting edge to these changing contours, maintaining an even pressure and hence an even thickness of sheet. As great an advantage as the uniform thickness is the consequent even distribution of water across the entire width of the veneer sheet, with benefits in the subsequent cut-off and drying operations.



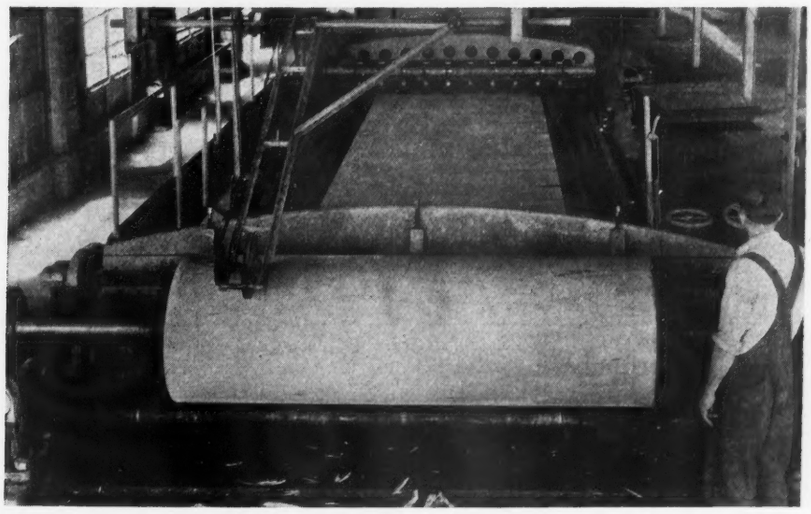
1. Logs are moved from yard storage to peeling lathe via electric crane, are accurately centered by sinking a hole in each end with a portable drill. The lathe is actually producing veneer in a fraction of the time formerly consumed in the preliminary peeling



2. Looking down the mill from the peeling lathe. The operator has control buttons to regulate three conveyors—first, a belt that takes the trimmings to the hog; second, a belt conveyor that runs under the main conveyor and takes away yieldable trim; third, the main conveyor that carries off the continuous veneer



3. Usual veneer-mill practice is to have the veneer cut into sheets by hand. Here it is done by a cut-off knife that moves right along with the veneer sheet. At this point, the conveyor belt rises to a height of 15 feet. Along it are eight take-off stations



4. There are three tons of "leaves" in this "book." Here an electrically operated turntable places the book in position for the trip through the kiln. The latter has four chambers. The newly peeled wet veneer in books comes into the fourth chamber, then at intervals is moved up a chamber at a time until it emerges fully dried

3 To permit a continuous operation without interruption for doing a job that would seem to require a temporary halt is the function of the unusual cut-off knife mechanism in the new Meyercord veneer mill. The usual veneer mill practice is to have the cut-off done by hand. Since the veneer is traveling along a conveyor as it leaves the peeling lathe, a workman can move his hand at the same horizontal speed as the conveyor, for the brief instant he is cutting through the strip. But to do the job by a machine-driven knife, without human control, presented the problem of preventing a backlash in the thin, moving strip of wood.

The Meyercord solution to this problem is a cut-off knife that moves right along with the veneer sheet while it is actually engaged. A wheel with pin-points on the circumference engages the veneer at the point where it needs cutting. This wheel is mechanically tied to a metal belt that actuates the knife. As the knife swings down into the wood, it is traveling with the material. It travels thus for a total distance of about one foot, meanwhile making the cut. Then, with the cut completed, it rises, the wheel disengaged from the veneer, and the mechanism returns to the original position ready to make the next cut.

4 Along this main conveyor belt are eight take-off stations, each with a workman standing on the floor below. When an operator below is ready for a sheet of veneer, he pushes a button. This opens a wire deflector on the conveyor line overhead, and in consequence the next sheet to reach the deflector slides down on a sloping conveyor belt. A signal on the slope cuts the deflector circuit as the sheet slips by, the deflector cuts out, successive sheets on the main conveyor go past to the farther stations. The eight stations permit each man to handle as much as he conveniently can when the lathe is running to capacity. The workman places

(Continued on page 124)

When Others Take a Licking

The author, always a good sailor, "reaches" for business

Eugene F. McDonald, Jr., became the father of auto financing when he set himself up in business in Chicago with the then-novel idea that people would prefer to pay for their cars and trucks month by month. That was in 1910. When 1917's call to colors came it was only natural that he joined the navy—serving as a commander in the Naval Intelligence—for he is a life-long lover of the water and a noted yachtsman. In 1920, when station KDKA began operation in Pittsburgh, he jumped on the radio bandwagon. Two young amateurs building radios on a kitchen table on Chicago's north side soon found themselves making sets for McDonald, and the call letters of their amateur station ZN became the inspiration for the name "Zenith," a name that now goes on more than 10,000 radios a day when factory production runs at capacity.

ANYONE WHO ATTEMPTS to consider inventory control as merely a plant problem is attempting the impossible. It is a problem so basic that the success of the entire business may rest upon it. It is far more than a matter of purchasing and production. With us it is a foundation stone of our finance, our sales, our customer relations, and our relations with our employees. Because we have built upon this foundation of inventory control, we have built our business more soundly than we could have done otherwise.

Any business with the dual problem of style and technical progress—what business lacks at least one of these?—must give a major share of management attention to inventory control. The reason is obvious. If the product is subject to style or to improvement, it is in a broad sense perishable. In our industry, for example, a radio receiving set that will not perform as well as the best available for the price, or that is housed in an obsolete style of cabinet, is as salable as a 1935 egg. And it takes all the profit out of a lot of sales when a manufacturer has to junk or sacrifice even a few pieces of finished goods.

To exercise a genuine inventory control it is necessary for a manufacturer to maintain close coordination between his sales department and the factory. It is not enough—at least in our business—to set up the manufacturing program on the sales department's estimates of what sales will be. Sales departments are made up of optimists; that is why they can sell large quantities of goods. But you must watch production folks too; they tend to be optimistic because large production schedules lead to lowered unit costs. Purchasing departments like to place large orders because they get prices down that way. The pull of departmental thinking is all toward letting inventories get out of control.

Our problem, like that of many industries, centers around annual models and seasonal sales. Our selling season starts in the spring with a meeting of distributors at our plant, followed by meetings of dealers at the distributors' headquarters soon after they have returned home. Mid-summer sees the beginning of retail sales of new models. Toward the end of summer retail volume picks up and builds to a peak at Christmas.

Translated into production schedules,

on Their Surplus Stocks—

Zenith has no surplus stocks to take a licking on. Reason why is what may be a new high in sales-production coordination—and this in an industry where style and technical progress combine to make last season's model about as salable as a 1935 egg

EUGENE F. McDONALD, JR.
President, Zenith Radio Corporation, Chicago

this means that we must establish a flow of new models coming from the plant and rolling toward the distributors by the time they come from our annual spring meeting.

This early production must be sufficient to provide a stock for the dealers some time in May; the first display of the new line in retail stores is most important to dealers as well as ourselves. Then we must keep enough sets coming off the lines to build up dealers' stocks to a working level, and to maintain distributors' stocks so that they can meet the dealers' demands.

Production must be sufficient to fill orders for the Christmas rush, but not so great as to create surplus stock that would later have to be sold at sacrifice prices. If we are to maintain the ideal situation which for many years we have been able to attain, we must work it out so accurately that there will be no surplus in the hands of distributors or ourselves when the season changes.

We have successfully avoided this situation to date, and have undertaken a continuous campaign in the industry to encourage other manufacturers to avoid it also for the general good of the radio business. We avoid it because by the time the season for price-cutting rolls around, when other manufacturers slash prices to get rid of surplus stock, we have no sets at the factory; distributors' warehouses are cleared, and so are retailers' floors.

What is the secret of this control? Once we have made the initial sample sets for our distributing organization, we do not manufacture on hope. Thereafter we demand facts before we authorize production. And the principal fact we demand is evidence in the form of orders from our distributors. Even a handful of orders from several large distributors is not enough to release a manufacturing order. It has to be backed up with statistical evidence in the form of a standard field inventory record showing that no distributor has an excess stock of any of the sets that other distributors are ordering.

If, say, the sales department wants 1,000 sets of a given model manufactured this week to fill the orders received, and we find that an Ohio distributor has more than he should have to meet the demands indicated by his sales volume during the past weeks, we may wire him recommending that he ship this surplus of 100 sets to the nearest distributor who is ordering them, and cut the manufacturing order to 900. Our entire emphasis is on maintaining a floating supply of our product sufficient to meet the retail demand we can conservatively count on by the time this product reaches the shipping dock. If we succeed in holding it down to this level, nobody along the line is in danger of getting his fingers burned by surplus stocks.

Zenith's emphasis in controlling inventories is to keep exactly enough radio sets coming off the production lines to build up its dealers' floor stocks to working levels, and to maintain distributors' stocks so that they can always meet the dealers' demands

A Sound Working Figure

Frankly, we wish we could always know precisely at any given moment how many sets of each model are in the hands of our retailers (as distinguished from distributors, whose stocks we know), and how many sets each retailer sold during the preceding week. In this respect we have to content ourselves with knowing that our distributors will try to keep their retailers from overstocking. We can estimate about how many sets are in all our dealers' hands at any time because we know from distributors' records how many they are shipping to their dealers in the aggregate from week to week. This estimate will be sufficiently accurate to give us a sound working figure.

When our distributors come to the spring convention, they have not yet seen the new line, but they know that shipments are rolling to them right then. We ship the minimum numbers of sets we know they will need to equip themselves and their dealers with demonstration and working stocks. It is here that we could easily stub our toes.

Let us assume we have a new model that looks like a "knockout" to everyone in the organization. The sales department thinks—as any good sales de-

(*Continued on page 122*)

Figure 6. Simple operation of getting cigarette and lighting it with match from penny box was used to demonstrate to operators how a job can be improved without speed-up

Sell the Operator

LET US GET BACK to the example that we were going to follow through to see how motion time analysis worked in improving methods. We said it made little difference what materials were handled or what operations were performed—the principles were the same. So let's select an article everyone is familiar with.

Figure 6 shows the layout for getting a cigarette and lighting a match. To the subject's right is a pack of cigarettes with one cigarette extending about three-quarters of an inch, to his left an ordinary penny box of safety matches with the box closed.

The operation we shall now study is: With the right hand get a cigarette and place in mouth. Next, with the left hand get the box of matches, move up from table, and start slide out with tip of finger. While the left hand holds the match box, the right hand gets the slide, moves it further out of the cover. Then, the subject gets one match, moves it out of the box, and closes the box. Now he lights the match.

A careful written analysis was made of this operation, and the values were calculated for each part of it. Who wants to know how long it takes to light a match? Who cares whether the job could be improved or not? No one, I am sure, but methods of analyzing apply, whether to cigarettes, shoes, cast iron, or silk stockings.

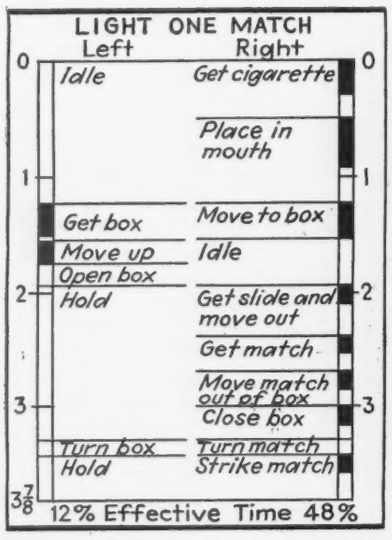


Figure 7. Analysis of cigarette-lighting operation shows two large items of ineffective time on left side, several small similarly wasteful items on the right

Figure 8. First improvement was to substitute a pull-quick type of match pack for the penny box. But upon analysis the operation looked bad from the standpoint of balance

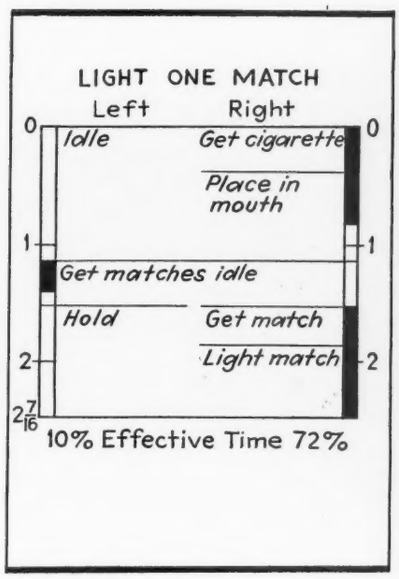


Figure 9. Analysis of the better method shows a clear 37 per cent improvement

Figure 10. Final improvement was to provide a holder for the pack of matches. Now the left hand gets cigarette while the right pulls and strikes a match. Perfect balance

on the Better Way

Part Two of an article emphasizing need for selling improved methods to operators—and demonstrating how this all-important job was done in a particular case

M. L. McKEAND

Industrial Engineer, A. B. Segur & Company, Oak Park, Ill.

After the written record was complete, it was analyzed to determine how effective each element is. Figure 7 is a bar chart made from this analysis which we showed the employees in the meetings. This chart is divided into right and left sides, and each element on each side is listed. The black and blank line near each side and the lines between elements indicate the amount of time each element required. The figures at each side are the seconds of time totaling 3⅞ for the cycle. The black parts of the line indicate the effective time, based on an ideal balance in the operation, whereas the blanks indicate the ineffective time or parts of the operation not accomplishing any useful work toward the finished job.

As we study the chart, we see large items of ineffective time on the left side and several small items on the right side. When we study each element to see how it affects the entire operation, we come to the conclusion that seven elements on the right side and the corresponding large item of waste on the opposite side do not represent a very good operation. At the bottom of the chart we see that 12 per cent of the time for the left hand and 48 per cent of the right side are effective. In other words 30 per cent of both sides of the operation is useful, while 70 per cent is waste or ineffective.

Suppose now we check into this pull-quick type of match pack shown in Figure 8. For an improved method of lighting a match, the improved operation would be: With the right hand get a cigarette and place in mouth. Next, get ends of pack with left hand and hold it firmly. Now, get end of match and pull out of pack. This time we lit a match in three operations instead of six. This should be an improved method requiring less time than the first method.

Again we used motion time analysis to study the improved method and to analyze the effective time.

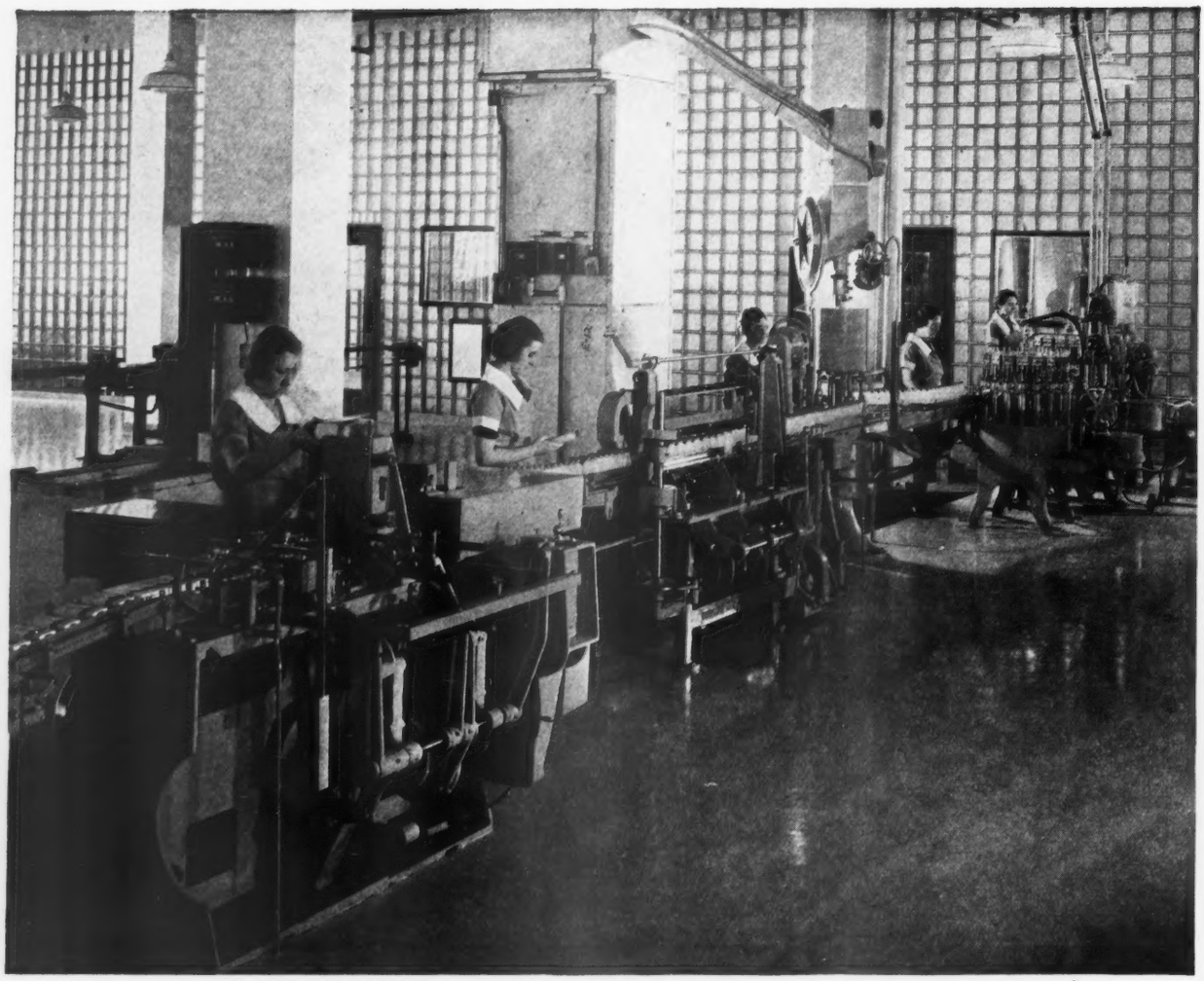
Figure 9 shows a bar chart of the improved method, and from this we learn that the time is 2 7/16 instead of the 3⅞ seconds on the first method. These time values are calculated from base formulas and would be increased approximately a third before using for production standards. The improved method required 63 per cent of the time of the first method to accomplish the same result. A 37 per cent improvement is a good one.

But before we congratulate ourselves let's check the analysis of the improved method and see if it is a well-balanced operation. How about the effective time? On the left side it is only 10 per cent, even less than on the first method; the 72 per cent on the right side is much better. But although we reduced the time 37 per cent, which we thought was a pretty good job, this chart still looks bad.

What is the matter with this im-

(Continued on page 136)

Figure 11. Bar chart shows increase in effectiveness, clinches argument that a job can be improved without speed-up



Empty bottles in re-shipper cartons are delivered by booster conveyor to the head of Campana Sales Corporation's packaging lines

Here Every Move Is Mechanized

LEWIS K. URQUHART
Associate Editor

Big job at Campana is to get bottles and other supplies to point of use, then move finished goods to storage or shipping. Campana's method approaches full automaticity

IN THE NEW PLANT of Campana Corporation at Batavia, Ill., materials handling closely approaches full automatic action. With a minimum of attention from employees, the system is designed to present materials and supplies to operators right at the point of application.

To be sure, employees load conveyors and boosters at the starting points; at the far ends other employees are taking away the finished products. But even here the greatest possible use is made of mechanical handling equipment. And what work must be performed manually is so laid out that the worker handles his tending of conveyors and boosters in batches; that is, he puts an hour's or two hours' supply of material on the equipment, which thereafter automatically delivers it to the working point.

As has been explained in a previous article,* the actual processing of materials into the finished products—Italian Balm and Dreskin—is fully automatic. No materials handling problem, in the ordinary sense, occurs in the processing department, because most of the ingredients are liquids and either flow or are pumped into the processes. But when the finished product is delivered to the storage tank, there comes a major packaging problem. Thousands of gallons must be placed in bottles—ranging from the 10-cent size to the generous dollar size

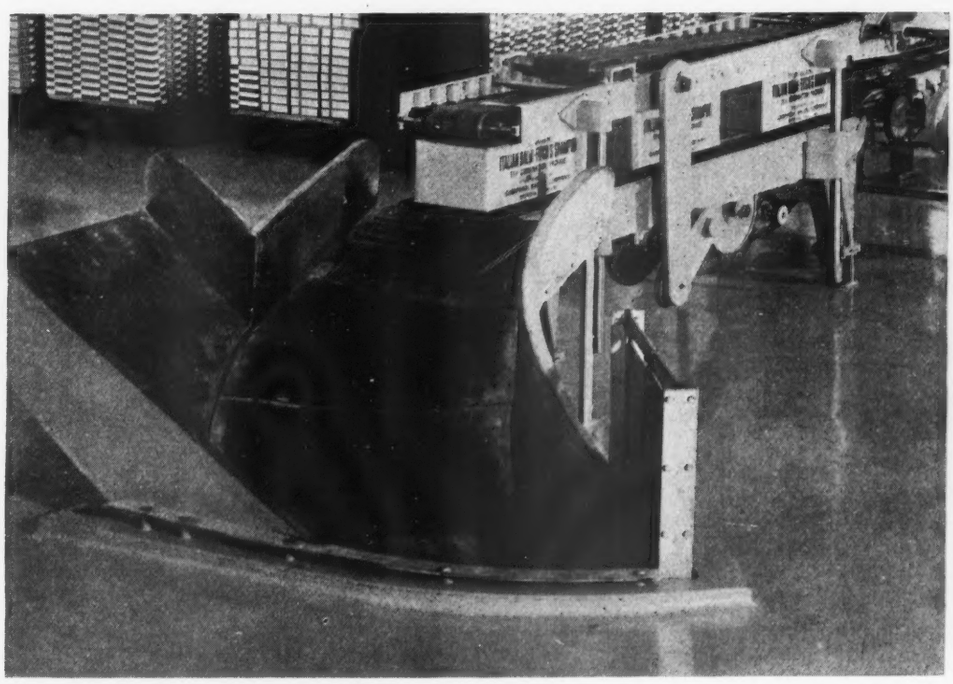
* "Errors Pushbuttoned Out," FACTORY, June, 1938.

in Italian Balm—and these bottles must be wrapped and packaged for display and shipping.

Packing is performed on the second floor. The first floor is used for receiving, shipping, and storing empty bottles, bottle caps, knockdown cartons, other packaging supplies, and finished products. The materials handling job is to tie these floors together in close coordination. There are several packing lines, varying with the size of package, but essentially they are about alike.

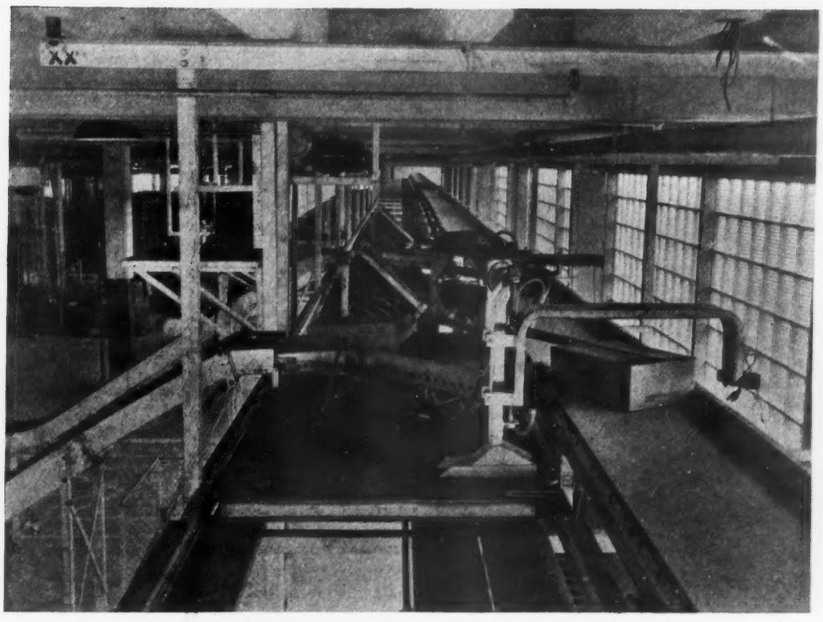
First step in the packing is delivery of empty bottles to the head of the packaging line. These come up in a booster; they are already in the reshipper cartons from which they are received from the glass plant, and in which the cellophane-wrapped bottles will go out to the customers. The automatic loader on the first floor is a 90-deg. channel of roller conveyors, so designed that it carries the cartons at an angle of 30 degrees from horizontal; the purpose of this tilt is to keep the bottles lying back flat in the carton, instead of falling backward and forward as they would if carried upright. The carton is carried at this angle all the way to the point of use, since the carrier or booster has a roller bed similar to the loader bed.

By a chain, the loader's rollers are held dead until the booster carrier is in position to receive the package. When the carrier strikes the terminal limit switches, a solenoid brake on the motor stops its travel. The automatic loader now moves forward one position, depositing a carton of bottles on the carrier. The carton, as it rolls upon the carrier, depresses a limit switch. This starts the carrier upward. At the top it strikes another limit switch 6 inches below the discharge point, and the carton remains in this position until the operator needs it. Then she pushes a button, the carrier rises 6 inches, the carton rolls off, the carrier starts down for its next load.



Filled and packaged bottles in shipping cases are discharged from sealing machines into spiral chutes which drop them to storage or to shipping on the floor below

Photographs by courtesy of Owens-Illinois Glass Company and The Alvey-Ferguson Company.



A 250-ft. belt conveyor runs the length of the building and automatically distributes cases of finished stock by deflecting them into movable take-away chutes

As long as cartons are placed on the automatic loader—it holds five at a time—and the operator removes them at the top, the booster automatically continues to raise and lower the carrier, and thus provide a constant supply to the second-floor packaging line.

The operator places the bottles on a conveyor leading into the packaging machinery. When she has emptied a carton, she drops the inner packing into a chute for waste paper. The empty carton she places on a slide leading to a belt conveyor which runs just below the first-floor ceiling. The purpose in locating this conveyor under the packing room is to keep dirt and lint out of the filling room. The conveyor, operating at a speed of 20 feet per minute most of the way, carries the carton 65 feet, but at the far end, approaching the booster, a section

runs 80 feet per minute. This faster speed is intended to separate any cartons close together on the belt.

At the far end, where the belt discharges and the booster carries empty cartons upstairs again, the automatic controls are really ingenious. Because the empty carton weighs so little, conventional limit switches could not be used, and the belt conveyor is controlled by means of a photoelectric relay, two mirrors, and two light sources. The beam of light from one source shines squarely across the belt conveyor, and is reflected from a mirror into the photoelectric relay. The other beam of light is controlled by a limit switch operated by the carrier on the booster; this beam projects across the carrier into a second mirror, and is reflected into the photoelectric relay —but only when the carrier is in receiving position.

As long as one or both of the light beams shines into the photoelectric relay, the belt continues to run. But if a case cuts the first beam while the carrier is out of loading position (and, therefore, while the second light source is dead), the belt stops. Thus cartons cannot run off the end of the belt when the booster is not in position to receive them. Likewise, the conveyor stops if two cartons come so close together that they break both beams of light simultaneously. A solenoid brake on the motor makes for quick stopping.

The booster carrier bed is a pan pivoted at the forward end and equipped with very small light rollers. In loading position, this bed is tilted so that empty cartons can move upon the carrier by gravity; in all other positions, the bed is horizontal. A mercury switch on a light cross-rod controls raising and lowering the carrier. The result is that when the operator on the second floor lifts the carton off the carrier, the carrier goes down for another load.

Serving the same station in the packing room, a dumbwaiter handles knockdown cartons and miscellaneous supplies. It can be sent up only by the first-floor control, down only by the second-floor control, thus preventing any moves at awkward moments. The carrier is flat-top, with no upward projections. It rises to working level on the second floor, and is there used as a worktable.

To keep the capping machines constantly supplied with caps, a skip-hoist is used from the first floor to the hopper on the second floor. Caps come from the supplier in cases and the hopper holds two cases. The booster bucket holds one case of caps. A switch on the side of the hopper closes the electrical circuit when the level of caps in the hopper falls below half full, the bucket rises and dumps into the hopper, then returns to the first floor. As it reaches the first floor, a small light goes on. The stockroom man empties a case of caps into the bucket, and presses a button closing a relay, which turns off the light and allows bucket to rise next time the switch closes.

Finished goods are stored on pallets and stacked in the warehouse with the aid of a high-lift tilting fork truck. Pallet loads are then moved as needed to portable roller conveyors in which the cartons are slid through the wall to waiting trucks or cars

Thus, as in practically all of this installation, the handling is 100 per cent automatic except for charging with supplies. Typically, a single filling of the bucket with caps is enough to last the upstairs machines for about an hour. And since there is at the moment two hours' supply in the hopper there is very little likelihood of a failure in cap supply.

As has already been mentioned, bottles move automatically through the various operations of cleaning, filling, capping, labeling, cartoning, and wrapping in cellophane; all this is performed on automatic machines linked

(*Continued on page 130*)

Scheduling Die Repairs Saves 15%

No hit-or-miss die maintenance for these people. They studied active dies, figured economical runs in pounds of stampings, impressed upon operators the need to take dies out of presses at the point where they get best production with least repair

S. W. CHANTLER

General Foreman, Westinghouse Electric & Manufacturing Company, Sharon, Pa.

ORDER NO.	SUB.	ASSIGNED ITEM	REQ. FOR SECTION	DEL. TO SECTION	DATE WANTED
170593	5		F-10	2	3/21

QUANTITY	DWG. AND SUB.	ITEM	STYLE OR PATTERN	DATE PROMISED
2,000#	219396	56		3/21

NAME OF PIECE: L-Plate — PROC. OR FINISH: None

MATERIAL FOR ONE PIECE: 11-3/4" x 4-5/8" x .014 Sh. St. #9050

NOTES:

ECONOMICAL LIMIT PER DIE: 5859 LBS. — TOOL NO.: 49145

PROD. CLERK	WRITTEN BY	SECTION	DATE	TIME	ORDER SERVICE REP.
E.J.L.	A.S.	Prod.	3/10/38		

DWG. & SUB. OR STYLE NO. | ITEM

MATERIAL REQ'D. FOR ORDER

P.D. SPEC. | NET AREA

RATIO | NET WT. EACH

MATL. PRICE | SCRAP CREDIT

MATL. COST EA. LB.

LABOR & O.H. COST EA. LB.

FACTORY COST EA. LB.

COST DEPT. NOTES

PARTIAL SHIPMENTS DATE	AMOUNT	BALANCE	OPERATION	MACH. SPEED	GR. NO.	STANDARD TIME SET-UP	STANDARD TIME RUN. TIME	POUNDS COMPLETED	APP.
3/17	459	1541						459	G.P.H.
3/20	701	840	Blank	260	5	1.52	.336	701	G.P.H.
3/21	840	Comp.						840	G.P.H.
			Break & Box		1		.066		

MATERIAL REQUISITION WESTINGHOUSE FORM 21179

Shown on each order is the economical run for the die that is to be used. In this case it's 5,859 pounds of stampings. At that point the die must be removed, its edges ground. This order is for only 2,000 pounds, and so can be run without interruption

HIGH DIE REPAIR COSTS are just a necessary evil—to the punch press foreman's way of thinking. He throws up his hands, ready to admit anything when the superintendent starts to talk die repair costs. What's the use, he reasons, management's always holding me responsible for keeping repair costs in line, but never shows me how to do it, never gives me any help in the form of data with which I can work. An average cost figure—the average over a period of years—is handed me as a guide for the current period, and I try to live within this limit. If I do, well and good; if I fail, I'm "on the carpet."

A number of schemes have been advanced during the past few years to control this expenditure. Some of these plans have been helpful, but the majority merely expose the expense after it has been incurred. What had been needed was the recognition of some new elements in the problem.

The elements we decided were important were depreciation, economical production limits for a given tool, and determination of the most economical period between major repairs and overhaul by the main toolroom. To obtain these data seemed a hopeless task. Some of them were found in the group leader's "butcher book," but it soon became evident to us that if we wanted clear, concise information we should certainly have to wipe the slate clean and start all over again from scratch.

A specially trained member of the time-study department was therefore assigned the task of compiling the data, under the direction of the head of the stamping division. This time-study man had fifteen years' tool experience plus ten years of time study on tools and die work. He was given full authority to put his ideas into effect.

There were approximately 100 active dies in the department, of which 75 were selected for development of the data. Dies of like size and shape were placed in a class, and for purposes of identification were each given a designation. By so doing we were able to place as many as five dies on test at the

same time. Each designation consisted of a letter and the tool number.

Dies studied were all fitted with new punches and die pieces, guide pins were re-bushed, and the tools were placed in what we considered first-class condition. Die pieces and punches were completely measured, and the measurements were properly recorded. A normal day's production, based on the wage incentive allowance, was set up as a measuring stick and run off.

After this one day's production had been run, the tool was removed and sent to the die repair department for examination. Rockwell readings were made of all hardened surfaces. Results were checked against the readings obtained before start of the test. Wear was accurately measured and recorded. Cutting edges were ground. The amount of material removed was noted on the test data sheets.

Under the Microscope

The die was then placed in production again, and the same run repeated. Procedure followed was the same as in the first run, except that after the run the die pieces were examined under a microscope for evidence of scoring. This was important because of the nature of the material we were punching. The material contained more than 4 per cent silicon and had a film of ferro-silicide which is very abrasive.

The same repairs made before were repeated, after which the die was once again returned to the press for a third run. This procedure was continued until the tool had been worn to a condition where a major overhaul was needed. At this point, we found that every die in the department was being operated in this manner, so that all dies except those used on short-order runs required new punches and die pieces when they were finally sent to the die repair department. We felt that we had found at least part of the answer to our problem by uncovering the fact that no attention was given to the possibility of doing minor repairs on the dies before the major overhaul point was reached.

Our studies had thus far shown that it was far from economical to run dies in this manner. Our next problem was to assemble this information and place it in the hands of the men.

Our solution was to reduce these findings to what we have termed an "economical run." That is, we calculated from our test sheets the point at which we got our best production with the least amount of repair, after deducting a certain amount of depreciation, based on the life of our die steel. To get this figure into the hands of the operators, a new job ticket was developed on which the economical run, expressed in pounds of stampings, is incorporated. The run figures determined by our tests are kept on records in the time department. Number of economical runs a tool has made is recorded on the die record, and these records are checked against the actual condition of the die when it is opened for a routine inspection. One of these job tickets is shown in the figure.

Our biggest problem was to "sell" the operator the idea that the tool had to come out of the press when, in his judgment, it was still working properly. He couldn't see why we wanted to grind 0.002 inch from the cutting edges when the inspector would still pass the stampings he was producing. This selling was accomplished by assembling on a board discarded die pieces in various stages of wear, each piece carrying a caption explaining why it had been scrapped, how much the die cost new, and approximately how much productive work had been done with it when it reached the particular stage described. At the same time we showed die pieces taken from dies operated under the "economical run" plan. That sold the idea.

After nearly a year's experience with this plan, we find that not only have we achieved our objective, reduced die maintenance costs, but we have also improved the quality of the product. The reduction in maintenance costs has been about 15 per cent to date, with more expected. The improved quality came about through the fact that dies were removed from the presses before they had reached the point where they might ordinarily produce stampings of an inferior or questionable quality.

Why exceed the Economical Limit?
This Punch cost $22.85 To place in condition after an "Economical Run" cost $2.58 There are approximately 15 runs left in this Punch.
This set of Die Pieces costing $34.97 was scored by exceeding the "Economical Run"
This Die could have been repaired at a cost of $.65 had it been removed after producing 10,232 punchings.
The "Economical Run" for this Die is 10,232 Punchings.
A Die Piece damaged so that .125 will have to be ground away to restore the Shearing edge. .125 should produce approximately 511,600 Punchings.
LOOK! This Die Piece taken from a Die after producing 10,232 Punchings. A .002 grind at a cost of .65 will restore its Shearing edge.
These new Punches cost $16.35 each. Use them economically and they will produce several million Punchings.
SEE YOUR FOREMAN and GROUP LEADER for the "Economical-Limits" of the DIES You Use.
THRIFT Pays BONUS!

Displays like this one convinced the operators that there was an "economical limit"

CORRECTIONS

The new Ternstedt Trenton Division plant was designed and engineered by Fisher Body Division of General Motors Corporation, not by Albert Kahn, Inc., as stated on page B35 of April FACTORY.

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The statement was made in "Living in Peace with 18 Unions" (March) that each contract is signed by a committee representing the employees and the local outside business representative, who also represents the International Printing Pressmen and Assistants Union of North America. This latter connection is true only of one union. Obviously one man does not represent 18 unions. Each union takes care of its own contract.

THE ABCs of PERSONNEL

Four of this month's alphabetic tips are dangerous—watch out for them. The fifth is a virtue. Next month, K's and L's

CHARLES S. STEVENSON

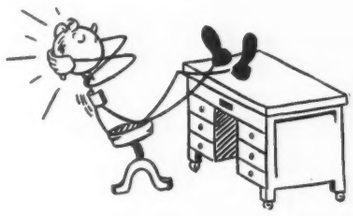
General Manager, Hall Brothers, Inc., Kansas City, Mo.

SKETCHES BY MATHILDE SCHULZ MUELLER

Idiosyncrasy

"Everybody's a little queer except you and me," said a humorist to a listener, "and sometimes I think *you're* a little off!" Actors, artists, musicians, and occasionally other professional men frequently create affectations that will give them what they please to term individuality . . . but in business, becoming conspicuous by other than your ability and accomplishments is generally injurious. Your clothes, your grooming, your speech, your reading, your hobbies, your associates, your economic views—excesses in these intimate and personal factors get folks to wondering if you are mentally normal . . . in such cases continuation of your leadership becomes involved . . . leave the flowing capes, the sideburns, the goatees, the long hair, and the moody mannerisms to the rugged individualists.

Indifference



Which has led to more men staying exactly where they started than any other one thing . . . in leaders of any nature this failing is seldom found for it is an almost insurmountable obstacle to leadership. "I'd rather have an interested, vigorous young man in charge of my production control than a dismal-faced veteran with years of experience," said an operating manager. A study of the personnel of the average organization will generally disclose reasons for the rapid progress of some and the slow advancement of others, notwithstanding an apparent equal amount of ability. The head of an insurance company comments: "It is no trouble for me to see why the executives of our organization have reached their respective positions . . . a continued interest in their work, their spirited ambition, and their unrestrained enthusiasm have kept them constantly outstanding . . . their progress has been merely a matter of time."

Impetuousness

A candidate for public office, rushing to address a meeting at which he was a last-minute substitute for a colleague, was accosted by a friend who asked: "What do you think about the political situation by now?" "Don't bother me," replied the candidate. "I've got to talk . . . this is no time to think." How pointed is this incident . . . and how devastating to one's development is the trait of "sounding off." The penitence that follows a display of rage and rashness is very humbling, but the effect of the tempest is no less damaging. Changing a tire with vengeance may console your emotions, but to vent your temper upon your personnel will bring only trouble and sorrow . . . and will definitely retard *your* advancement. A man who cannot control himself cannot control others!

Impersonality

The contemplated changing around of six departments in a papeterie plant brought a complaint from the shipping clerk that the adjustment would take desirable north light from his people and put them on the sunny side of the building. He did not visualize that this north light, when made available to the plant's inspection department, would allow sharper and more complete inspection of the company's products, which would result in considerable reduction in complaints about quality of the stationery shipped to dealers. In football language, protecting one's goal line is good defensive strategy, but it has rarely scored for a team. An impersonal view of any problem is characteristic of a *real* executive . . . this is true not only in the consideration of policies and operations, but also in the handling of personnel.

Jealousy

The treasurer was talking to one of the accountants: "Nelson, I would have recommended you for chief payroll clerk, but you are so jealous that the moment you saw the rates and discovered that certain persons were receiving more than you, your envious attitude would make it impossible for you to succeed on the job. It is common gossip around here that when anybody gets a break you invariably resent it. Your failure to congratulate John Sylvester on that promotion of his hurt only you. Your scorn and derision of the sales outline presented by Bill Schaub last month was noticeable to everyone. You begrudge any of the fellows a new car. This weakness of yours is the reason why others are moving past you. Because of your jealousy and envy you are your own worst enemy." Jealousy is not restricted to lovers . . . it is a definite hazard in business.

Paper-covered wood strips, one for each order in the plant, are filed numerically in the leaves of this "book," show the chief dispatcher at a glance where the order is and where it should be

Sure Now to Ship on Time

Visible follow-up plus an interdepartmental loud-speaker system gives this concern an up-to-the-minute check on the whereabouts of every order in the works, yet involves none of the costly clerical work so often associated with production control

C. E. RUHL
Production Control Manager
The Standard Register Company
Dayton, Ohio

WE HAVE TO SHIP ON TIME. So do you. In at least this one respect no business is "different." Ours, for example, happens to be the manufacture of continuous-fed business forms. Yours may be almost any other in the whole wide range of manufacturing. But you have to schedule production the same as we do. And we, like you, have to follow up orders after they have been scheduled in order to be certain that delivery dates are being met.

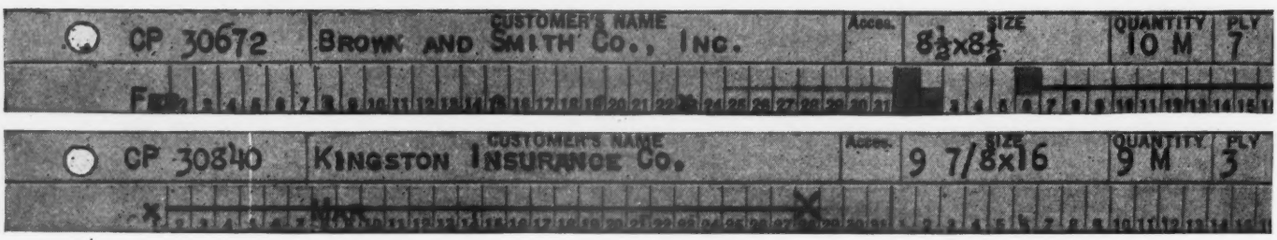
Our method of solving this common and important problem should therefore be of interest to plant operating men in the other manufacturing industries. It is one, I feel sure, that can be readily adapted to many other types of products.

The solution we have worked out is, in brief, a combination interdepartmental communicating system and order follow-up.

As orders come in, they are scheduled by the order planning department—through planning, layout, and composing when, as in the large majority of cases, a proof is to go out to the customer, all the way through the plant in the exceptional cases when no proof out is necessary. At the same time the department checks with the materials control man to make sure that the right kind of paper is available when the order is ready to go on the press, also for carbon paper, packing boxes, and shipping cartons.

Orders are then passed over to a girl who types order number, customer's name, size, quantity, ply, press number, and schedules dates in the upper half of a paper-covered wood strip ½ inch wide by 12½ inches long. These strips come in continuous form; after the data have been typed they are broken apart and filed numerically in visible panels. White strips are used for offset work, yellow for orders that go on stereotype presses. Each panel—there are 46 of them hinged like the pages of a book—holds 60 orders. Thus the girl has, right in front of her, a strip for every order in the plant.

But the procedure can best be followed by taking two typical orders.



First an order for the mythical Brown & Smith Co., Inc. It went to the planning department on Feb. 23. It was a stereotype job. Proof had to go out to the customer.

It was therefore scheduled through planning, layout, and composing, and passed over to the girl who typed the data in the upper half of a yellow strip—see the figure.

The lower half of the strip, it will be noted, is marked off into months and days. She typed in the names of the months and marked a cross on the day the order left the planning department. She also blocked in, in red, the lower half of the date—March 2—when the proof was due to go out to the customer.

Now her job is to record the progress of the order, so time out to describe the loud speaker system by means of which this information is transmitted. There is a master station located in the planning department with six substations as follows: (1) Layout-composing, (2) composing-photolith, (3) press planning, (4) collating, (5) register assembly, (6) shipping.

There is a chief dispatcher in the planning department, and a dispatcher at each substation who also has other duties. Each dispatcher reports to the chief dispatcher every two hours. There is no paperwork. The chief dispatcher simply jots down the order numbers that have passed through a given department and turns them over to the girl who runs the control panels.

For instance, to get back to Brown & Smith's order, the proof was actually reported out to the customer on March 1, a day ahead of time, so she blocked in the square for that date. And it came back from the customer on March 6, so she blocked in the upper half of that square.

At this point, the order was scheduled through the other production departments, and the dates were filled in in pencil. Subsequently, as orders were reported through the various departments, the girl drew a line through those departments, incidentally switching to a blue pencil, and likewise drawing a blue line through the dates in the lower half of the strip.

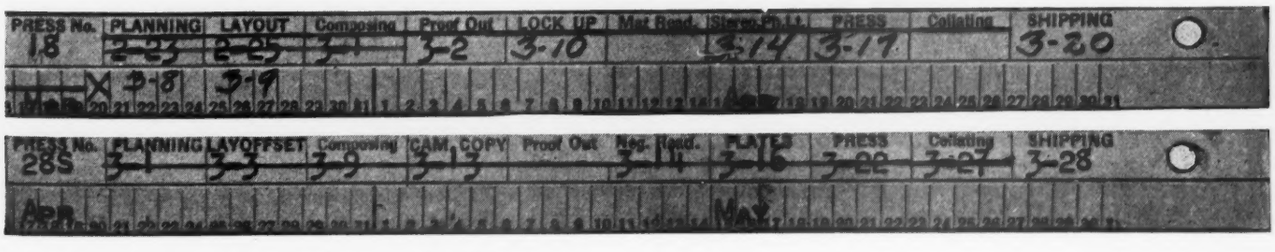
The order was shipped, it will be noted, on March 20 as scheduled, and on any day prior to that time it was possible to see at a glance where it was and where it should have been.

But let's take another order—for the Kingston Insurance Company. This was for offset work and was one of the exceptional cases when no proof had to go out to the customer. It was, therefore, scheduled on receipt all the way

(Continued on page 140)

A flick of the finger puts the chief dispatcher in touch by loud speaker with any one of several departmental control stations. At the end of the day he lists delayed orders, then notifies each station. Below, typical strips on which progress of orders is noted

Clem Ruhl's first job, fresh out of eighth grade, was in his father's grocery store in Hamilton, Ohio. Then he went to work on the calenders at Champion Coated Paper Company. From there to the lithographing press department of American Can, later to Hamilton Automatic Register. Came to Standard 20 years ago last month. Likes to get behind the wheel of his car and go places. Enjoys an occasional game of golf. Otherwise apt to have his nose buried in a book—his way of making up for the formal education he never got.



A Dollar on Safety Pays Four

We asked the president of the National Safety Council a large question when we asked what safety costs. His reply, as paraphrased in the title of his article, is necessarily a general one. But it is based on a broad knowledge of safety savings in a wide variety of industries

D. D. FENNELL
President, National Safety Council, Chicago

WHAT DOES SAFETY WORK cost and what will it accomplish? Of course, such a general question can have only a very general answer. It is as though one were to ask, what does job supervision cost and what can it accomplish? Obviously, job supervision must be based upon number of employees, conditions of the working processes, quality of production desired, and efficiency of the supervision. In like manner, effective safety work must be based upon number of employees, hazards of the working processes, records of the accidents suffered, and thoroughness of the safety organization.

Just to give us something concrete to think about, let me say that in a plant large enough to require a full-time safety man, yet small enough and compact enough to be looked after by such a man unaided, the average cost of salary, supplies, incidentals and other expenses need not exceed $5,000 a year. This expenditure may very well bring economies aggregating perhaps $20,000 a year.

Although this estimate is made with a broad knowledge of safety costs and safety savings in a wide variety of industries, it necessarily covers many variables. For example, one plant with 1,000 employees might be adequately served by a single safety man, while another with an equal number of employees might require a competent assistant for the safety man. A third plant with 3,000 workers might need no more than these two competent men. Again, one plant might have suffered a large number of severe accidents in a given period of time, and efficient safety work might effect great savings in the following year; while another plant of similar size might have been more efficiently organized so that accidents were fewer. and savings therefore proved to be correspondingly smaller.

An Ohio plant in two years worked 6,682,071 man-hours, and suffered accident costs totaling $79,278.11, or $11.80 per thousand man-hours. Then safety work was organized, with the result that in the following two years, during which 4,370,608 man-hours were worked, the accident costs were $29,040.73 and this figured $5.60 per thousand man-hours. The following year the plant worked 1,516,607 man-hours, and accident costs were $7,292.36, or $4.80 per thousand man-hours.

An Illinois plant, over a 10-year period, reduced its compensation payments from $39,802 to $8,470, a saving of $31,332, or 79 per cent. Medical expenses were reduced from $19,220 to $11,573, a saving of 40 per cent. The combined figures showed a two-thirds reduction in the 10-year period. Man-hours worked were somewhat less in the end of the period, it is true, but this was more than offset by increased coverage and increased scales under the State Workmen's Compensation Act.

Here is the record of an Iowa company over a period of five years. Prior to the organization of safety work in the plant, accident costs amounted to $1.25 per $100 of payroll. Steady reductions in these costs were effected, so that in the final year of the record period the accident cost per $100 of payroll was only $0.11, representing a

saving of more than 90 per cent in the space of five years.

A paper manufacturer with from 500 to 1,000 employees has carried on intensive safety work through a period of eight years. Comparing his accident costs with the year before safety work was begun, there has been a sizable saving each year, the total amounting to $71,000 in the eight-year period. The employee personnel has gradually been increased and payments under the State compensation law have also been increased.

A large petroleum company had a compensation cost of $11.20 per employee, and by a complete and persistent safety program reduced this to $1.67 per employee at the end of a 10-year period. Likewise, a medical expense of $10.70 per employee was reduced to $7.60. Total savings amounted to $12.63 per employee. This company figures that in recent years it has been saving $50,000 annually in compensation alone, as compared with its cost prior to the organization of intensive safety work.

Examples of this kind could be quoted almost endlessly out of the records of the National Safety Council. It is not unusual for a given plant to work over a long period of time—one, two, three, even more years—without one employee suffering a lost-time accident. The Council has a list of fifteen outstanding safety records made by industrial companies, the lowest in that list having built up a perfect safety record of 4,000,000 man-hours, and the highest a record of 11,361,846 man-hours. Is it necessary to say that these safety records epitomize the saving of countless dollars as well as of injury to employees?

The sole reason why such opportunities for money savings remain unexplored in a large number of American factories is that, prior to the undertaking of safety work, the savings are not obvious. It is difficult for management to estimate what the savings might be because accurate records of the accident losses have not been kept. A common response to my inquiry about accidents in the average industrial plant is that they "don't have them," or that they "have very few accidents." Yet in such cases it is frequently possible to trace down in personnel changes and miscellaneous items of expense that there has been a continual drain upon the company's resources due to these accident losses.

If the direct costs of accidents are kept with some accuracy, it is still never possible for these unsafely organized plants to know the indirect costs. In safety language the direct costs of an accident comprise compensation and liability claims, medical and hospital expense, insurance premiums and cost of time lost when not actually paid by the employer. But there are numerous other sources of accident expense, so many in fact that, based upon scientific study of many thousands of accidents, it has been determined that these "indirect" costs average not less than *four times* the direct cost.

Among nine listed items of indirect cost, here are just a few that may be very heavy to the industrial employer when an accident occurs: Cost of time lost by other employees who stop work out of curiosity or sympathy, or to assist the injured; cost of time lost by foremen and other executives while assisting the injured, investigating the cause of the accident, arranging for production to be continued, selecting and breaking in a new employee to take the place of the injured, and preparing state accident reports or attending hearings; cost of damage to the machine, tools, or other property, and spoilage of material; cost due to interference with production, failure to fill orders on time, loss of bonuses; cost due to the loss of profit on the injured employee's productivity.

"Bill," said the safety man, "I notice your men are using a lot of different methods of getting a load off of a hand truck"

Not a Flag-Waving Job

Much of the apathy and even direct opposition to organized safety work comes from a lack of knowledge of just what it constitutes. Too many persons, including some so-called safety men, consider that accident prevention is largely a job of flag-waving and putting up competitive rewards or penalties contingent upon the safety record. Publicity and propaganda, both within the plant and among the workers' families, has its rightful place—but it is a long way from being the entire job. It is a part that shows on the surface, and I believe a reasonable amount of such surface activity and enthusiasm is often a distinct help in creating employee interest. The knowledge that his department is vying with others in the effort to complete the month or the period of a contest without anyone being hurt, and that one of the results will be a gold star opposite the name of his department on the bulletin board if he and his fellow employees work carefully, certainly is not going to be a damper upon the desire of any one of these employees to work safely.

But there are other obvious evidences of the well-organized safety program. In first importance I should place the

(*Continued on page 126*)

What Kind of Plant Newspaper?

1. What size to adopt?
2. What paper to use?
3. What halftone screen?
4. Publish how often?
5. How get the news?
6. What staff?
7. How apportion space?
8. What stories are good?
9. What stories to avoid?

HAROLD W. CLEVELAND

Advertising Department, New Departure Division, General Motors Corporation, Bristol, Conn.

So YOUR COMPANY is thinking about publishing a plant newspaper for its employees? Perhaps, and we sincerely hope, you have some men in your organization with newspaper experience who know how to handle the matter capably and successfully. On the other hand, perhaps you will be receptive to a few practical pointers.

For a moment, let's consider the *why* of a plant newspaper. Today, more than ever, one of management's jobs is a continual effort to strengthen the loyalty of its employees, to build up their good will, and to increase their pride in their plant and their product. One of the methods of accomplishing this desired end is the plant newspaper —a plant newspaper whose primary function is, and should be, to mirror the activities and personalities of employees. But you know all that. . .

New Departure News, issued for the past twenty years by the New Departure Division of General Motors, has often been pointed out as an example of an exceptionally good plant newspaper. So, if you do not mind, let's refer to it occasionally in our discussion of what to do and what not to do.

What size shall our newspaper be? The majority of the hundreds of plant newspapers published throughout the country measure about 9½ by 12¼ inches—a most practical and economical size, easily folded and tucked into one's pocket. Each page will carry four columns of type, two inches wide.

What kind of paper shall we use? Do not use a cheap stock that will result in a cheap-looking paper. You do not need an expensive coated stock. A good grade of English finished or calendered stock will give you an attractive job, and in addition will permit the use of fine-screen halftones. Discuss the matter of paper stock with your printer.

What size screen for the halftones? Fine-screen halftones will bring out the details of photographs to best advantage, consequently let's stipulate 120- or at least 100-screen halftones. We'll leave coarse-screen cuts to regular newspapers.

How often shall we publish? You'll have to decide that yourself, knowing what your budget will be. However, you should publish at least monthly, maybe every two weeks if you have

THE REFLECTOR
SAVINGS FUND. NOW UNDER LEGAL SHADOW. RETURNS $53,000.00 TO EMPLOYES
FISHER PLANT LIFE
Delco-Remy Clan
HYATT HIGHLIGHTS
RUTGERS SHOP COURSE RESUMES ACTIVITIES
GLEE CLUB AGAIN
NEWS & VIEWS
NEW DEPARTURE NEWS
FACTORY NEWS
G.M.T. LEADING IN GOLDEN GLOVES
ENGINEERS TO HEAR C. A. GREEN
District Representatives Awarded Trip To Pontiac
NOVICE ENTRIES WIN 19 OUT OF 27
News Braker
GM Has Best Safety Year On Record
ANTHONY G. SIMCROPE PUBLIC CLUB PRESIDENT
Tax Returns Due Before March 15

Most of the hundreds of plant newspapers published in industry measure about 9½ by 12¼ inches. Here are eleven typical examples

eight or ten thousand employees, or more. Monthly will suffice, though.

How shall we gather the news? Simply by having plenty of reporters. *New Departure News*, for example, has approximately 60 reporters, each one responsible for the personal items, or briefs, concerning fellow-workers in his particular department. In addition, it is a good idea to have two or three men to dig up general news stories concerning the plant, the product, social activities, human-interest stories, etc.

Early in the month the managing editor should send a note to each reporter telling him the closing date for that particular month's issue. The reporter then has no excuse for not getting his briefs in on time. Incidentally, alert departmental reporters are often the source of excellent general news material.

For instance, they may tip you off that the elderly chap who works in Department X was once a sharpshooter with Buffalo Bill's Wild West show—and that fact is worth developing into a general human-interest story. Often, too, the departmental reporter includes among his items briefs of the following nature: "Bill Jones of the department won the Grand Prize at the State Fair for his collection of carnations." An item like that is worth inflating. Send one of your general news reporters to Bill and get a column story on his carnation activities.

How about the staff? Well, you will want a managing editor to supervise the sheet—to be its sparkplug. You will want a sports editor, maybe two. You will want someone to edit the departmental briefs to make sure that they carry no hidden sting and to do a bit of pruning—pruning so that Department X which has only 10 employees does not get twice as much space as Department Z which has 50 employees.

Proofreader and Paster-Upper

A proofreader will be necessary, as will someone to paste up the pages for the printer. The men best qualified for these latter tasks are the people in your advertising department.

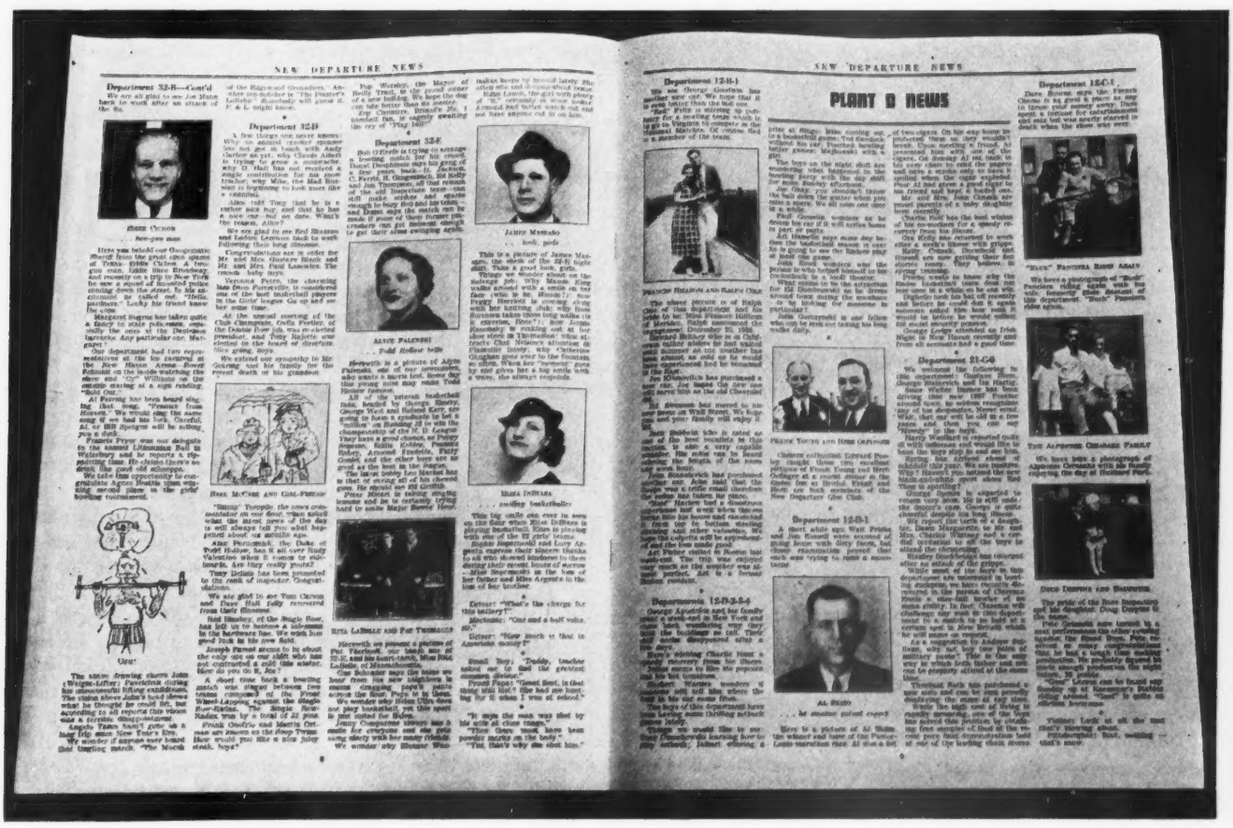
How shall we apportion the pages? In other words, how shall we divide the pages devoted to sports, to general stories, to departmental items, etc.? Take a glance at *New Departure News* again. Normally a 16-page monthly, it devotes two pages to sports, four and sometimes five pages to general news, and the remainder of the pages to departmental briefs, listed by departments. At least half of your pages, whether your newspaper be an 8- or a 16-page affair, should be devoted to departmental items, because it is in the departmental news that you can mention literally hundreds of employees by name and job.

What are good stories? Outside of the departmental personals, what shall we feature in our paper?

Here are a few suggestions. Write up the hobbies of different employees, illustrating the story with a photograph of the collection or work of the hobbyist featured. You'll be surprised at the number of men and women in your plant who are model ship builders, stamp collectors, gladiola growers, woodworkers, etc. Play up employees with long service records. Have old employees hunt through their attics for group pictures taken in your plant twenty or thirty years ago.

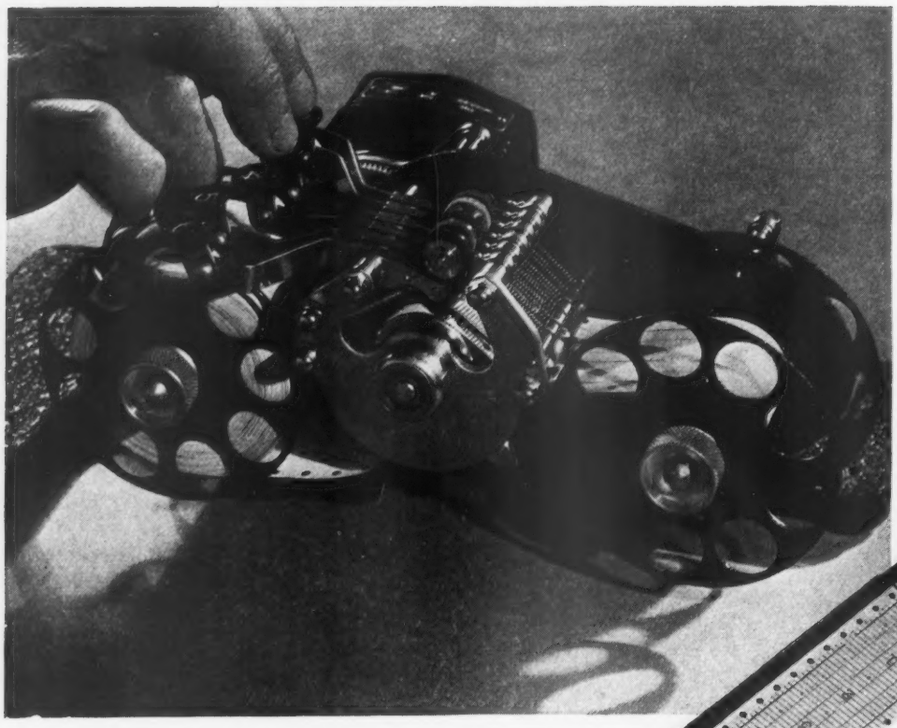
The early history of your plant is good for a number of stories. New products can be written up, as well as unusual installations or uses of your present product. Cover the sports life of your employees. Use jokes liberally. Have your company doctor or safety engineer write frequent articles to propagate the idea of safety among your employees. Employees elected to high fraternal offices warrant write-ups. If a group of your workers plan a

(*Continued on page 140*)

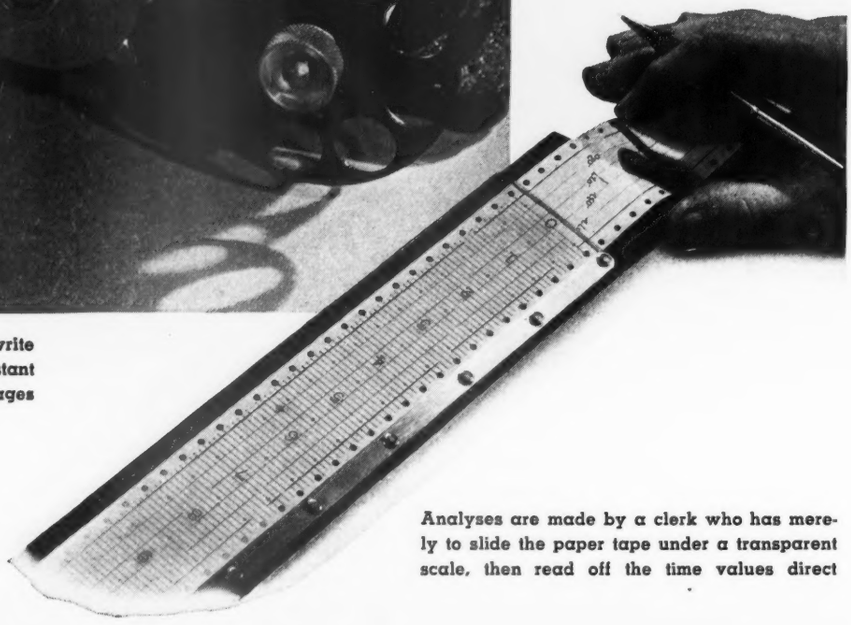

NEW DEPARTURE NEWS

PLANT B NEWS

What every plant newspaper editor wants in his paper is names, names, names. And, of course, plenty of pictures of plant people



No stopwatch to look at. Nothing to write down. Every movement recorded the instant it occurs. Those are outstanding advantages of making time studies by machine



Analyses are made by a clerk who has merely to slide the paper tape under a transparent scale, then read off the time values direct

Now Machine-Made Time Studies

HERE IS A NEW METHOD and machine for making detailed time studies. The engineer simply decides how best to split up the operation. Numbered buttons are pressed in proper sequence, and out comes the graphic story in different colors with such a degree of accuracy, that 1/2,000 of a minute can be easily read. There is no watch to look at, nothing to write down. Every movement can be recorded the instant it occurs.

A roll of perforated paper tape is threaded over an all-metal sprocket. A hardened steel marking wheel in the end of each type bar is held firmly against the tape by suitable spring pressure, while round felt pads of different colors ink these steel wheels as they are made to revolve by contact with the moving paper tape. The result is a series of six long colored parallel lines, each of which is broken whenever a numbered button is held down.

To make a time study, the device (called the Marsto-Graph, and just announced by C. A. Marston Company, Braintree, Mass.) is plugged into any a.c. outlet. The engineer observes the operator, and holds down button No. 1 until element No. 1 of the job is completed, immediately pressing buttons No. 2, No. 3, etc. If there are more than six elements, the buttons are held down in reverse order, until the cycle has been completed. Each time a button is depressed the marking wheel clears the paper tape, breaking the otherwise continuous line.

Analyses are made with the aid of a transparent scale. Standard tape travel is 10 inches per minute. The distance from one end of the transparent scale to the other is exactly 10 inches, divided in tenths—just like the dial of a regulation stopwatch—while each of the graduations represents 1/100 of a minute, and the space between graduations is exactly 0.100 inch. The tape is slid under the scale, and time values are read off direct and written in by an office assistant, relieving the engineer of much clerical work he himself has found it necessary to do in the past.

With this new equipment and a little practice, more and better time studies can be made in a given period than ever before. There being nothing to distract his attention, the engineer can concentrate on every movement and detail of the job, and record them individually by pressing the proper button the instant of occurrence. Accuracy is increased, because chance of error in reading stopwatch, writing down figures, and making final calculations is eliminated.

Management Shorts

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary management accomplishments. Accepted articles will be paid for

PUBLIC AND EMPLOYEE RELATIONS

Night Blindness Tests Used as a Safety Precaution

DR. J. F. NEUMUELLER, *Director Bureau of Visual Science, American Optical Company, Southbridge, Mass.*

Recent clinical and other tests indicate that vitamin A not only improves night vision and helps to overcome night blindness (the inability of the eye to see well in dim illumination) but also relieves eye fatigue and strain among certain types of industrial workers. As a result, dietary analyses and changes have been made, and general health and capacity for work have shown marked improvement.

Medical science has found ample proof of a relationship between vitamin A deficiency and certain pathological conditions involving various types of diseases. It is evident, therefore, that a test for vitamin A deficiency may be a distinct benefit both to employers and employees. There is no question that prevention of disease or accidents due to night blindness will reap huge dividends for employees and management.

A night blindness test—the indicator of vitamin A deficiency—is made by exposing the eyes of a person to a brilliant light and immediately afterward subjecting them to faint illumination, measuring the time required for regenerating the visual purple in the eyes. Vitamin A is the agency that restores the visual purple, so that if the return to normal is too slow, the subject is deficient in vitamin A.

There are many applications for such a test as a safety precaution in industry. Wherever an individual is alternately exposed, in his work, to glaring light and low illumination, and where his ability to see well at night may involve either his personal safety or the safety of others, a periodic check of that individual's dark adaption is an important precaution. Although dark adaption studies in industry are still in their infancy, they will, when generally adopted, aid in safeguarding the employee's health and welfare and, as a corollary, increase his efficiency.

•

How Good Is Your Factory?

SOURCE
Marschalk & Pratt, Inc., New York

Some questions to ask yourself about your factory and its activities:

1. Its appearance: (a) Is it well painted? (b) easily identified? (c) attractively kept grounds?

2. Are visitors welcomed?

3. Are there examples of your products displayed where employees as well as visitors can see them?

4. Do your employees like to work in it because it is: (a) Large? (b) clean? (c) convenient? (d) comfortable? (e) as safe as modern safety engineering can make it? (f) makes a well-known product in which they take pride.

5. Is advancement kept largely within the ranks?

6. Are there employee organizations, such as: (a) Social clubs? (b) dances? (c) picnics? (d) athletics?

7. Is there an employees' newspaper?

8. Is there inter-plant or inter-departmental rivalry on the basis of: (a) Production? (b) small percentage of inspection rejections? (c) reduced costs? (d) bonuses earned? (e) accidents prevented?

9. Do you hire: (a) Apprentices? (b) young men out of high school? (c) college or technical school graduates? (d) men over 40? (e) crip-

When the young lady drinks her glass of water it will be from a germ-free glass, for ultraviolet radiations from the special lamps mounted above the trays have sterilized the tumbler. Besides the water fountain, silverware, food trays, and refrigerators in this Westinghouse employees' cafeteria are similarly equipped

ples or men of limited capacities for suitable jobs? (f) through a modern personnel department? (g) what percentage of your present employees are sons of employees?

10. Do you maintain any schools or training classes for employees?

11. Do you encourage employees to spend time in study in outside schools? How?

12. Have you any of the following: (a) Thrift plan? (b) company stock purchase plan? (c) profit sharing? (d) bonus plan? (e) pension plan? (f) group insurance? (g) share-the-work plan? (h) severance pay?

Editor's Note: The above is from a public relations questionnaire entitled "Your Business and You." It is reproduced here in the thought that others may find an idea or two in it.

•

Keep Safety Contests Short

Generally speaking, it has been found desirable not to hold safety contests of longer duration than a month or so, as accidents often have a way of all coming at once. When this happens and a department has a series of accidents early in the running in a long contest, it tends to be discouraged from making further effort to win. Then, too, many contests make for greater novelty.

PRODUCTION PLANNING AND CONTROL

Inspection Tags Keep Good and Bad Apart

JOSEPH MANUELE
Westinghouse Electric & Manufacturing Company, East Pittsburgh

There must be forms on which the inspection department can record its findings. All good material must be tagged to show it has been inspected and who has passed it. All defective material must be tagged to keep it from getting back into production.

Shown here are two tags that have proved their effectiveness. Others can adapt them to their own use with little or no trouble. On the left is the simpler tag which is attached to ok'd work. The more complicated one to the right is for rejected material, and shows what is defective, what must be done before the work can be put back in production. The bottom tag stays on the material; the other three copies go respectively to accounting, production, and inspection departments.

Single tag on the left goes on ok'd work; defective work gets tag on the right

•

Cut Time of Writing Production Orders

B. MASCOLO, *Production Engineer*
New Jersey Machine Corporation
Hoboken, N. J.

Our organization manufactures labeling machines on a production basis as well as machines to a customer's specific requirements. In our work, the problem of knowing and recording how long it took to perform each machining operation had to be solved. The question of taking time studies was considered and eliminated, for the present, because of the expense involved. We decided instead to enter individual orders for each part on a customer's order. Then by looking to the men's time cards to note when they started and finished work on each part, we were able to learn and record the machining time on a cost card.

However, as the volume of work increased we found that the system had a drawback; so many orders had to be written that they could not be gotten out to the shop fast enough. Confusion and delay resulted.

Our procedure for entering orders called for preparation by the production office of a list of parts to be manufactured. This list was sent to the general office where the parts were given order numbers, recorded in a ledger, and typed. Five copies of each order were necessary, which meant putting four carbon sheets between five order blanks before typing. Furthermore, the order could only be typed at a certain time of day; any orders arriving in the general office after 11 a.m. were held over until the next day. The red tape and delay in getting orders typed resulted in loss of production control.

We solved the problem by installing an autographic register machine in the Production Department. Orders are written by hand on the machine, which automatically makes the five copies needed. The whole order-writing job is done in the time it used to take the Production Department to list orders it wanted typed. The time-consuming task of slipping carbons between copies of the order has been dispensed with, for the machine feeds carbons automatically. And orders can be written at any time of the day.

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ANOTHER $500

For FACTORY Readers

★

Last year 53 FACTORY readers pocketed $500 in special awards for cost-cutting ideas. A similar opportunity is now offered in connection with our

Second Annual **QUICK WAYS TO PROFITS** *Issue*

★

We want cost-cutting ideas of the type published each month in "Management Shorts" (page 67 of this issue) and in "Maintenance Service Shorts" (page 88).

Somewhere in your plant there are scores of them . . . you know where they are . . . how they've contributed to low-cost production . . . improved quality . . . or made your plant a better plant to work in.

The plot, of course, is for you to tell us . . . and for us to tell FACTORY's other 74,999 readers—all of them, like you, plant operating men in the manufacturing industries.

We'll run what is, in effect, a cost-cutting clinic . . . a sort of idea-swapping lawn party. You'll contribute your pet cost-cutting idea. And you'll pick up a dozen or more cost-cutting ideas that have worked successfully in other plants, hence are ready to go to work in yours.

Keep that in mind, therefore, when you select your idea. Make it one that can be used in almost any other plant, no matter what its product.

The $500 is our way of injecting a little of the old competitive spirit into this thing. Remember, 53 awards. Your cost-cutting idea may win one of them. If not, but if it's still good enough to publish, we'll pay for it at regular FACTORY rates.

You don't have to be a "writer" to win an award. The idea, not literary ability, is what counts. Simply tell the story in your own way. And keep it short—not over 500 words.

You have until July 15. *But do it now.* And don't stop with one idea. Send in as many as you like.

See next page for rules. Enter your name now. Use one of the handy reply cards

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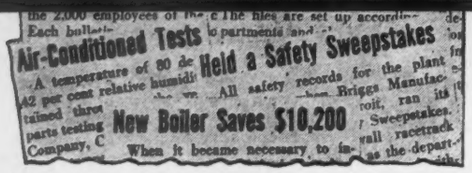
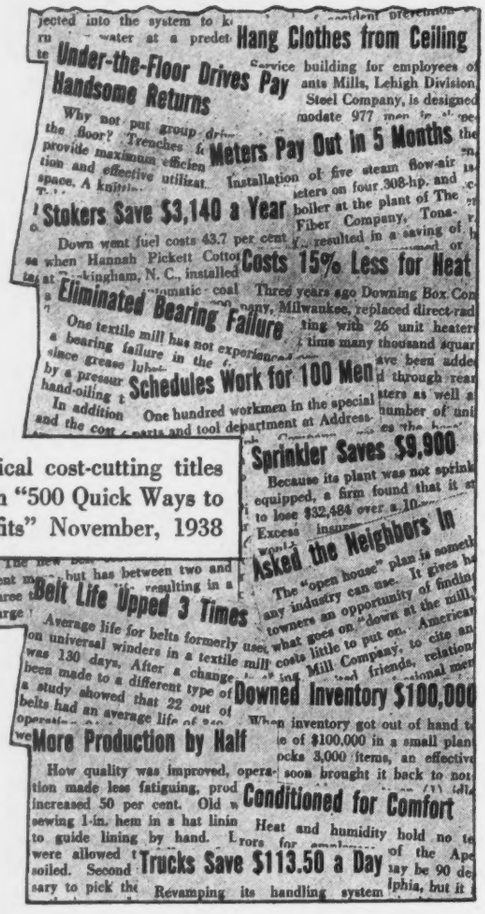


$500 IN 53 SPECIAL AWARDS


Hang Clothes from Ceiling
Under-the-Floor Drives Pay Handsome Returns
Meters Pay Out In 5 Months
Stokers Save $3,140 a Year
Costs 15% Less for Heat
Eliminated Bearing Failure
Schedules Work for 100 Men
Sprinkler Saves $9,900
Asked the Neighbors In
Belt Life Upped 3 Times
Downed Inventory $100,000
More Production by Half
Conditioned for Comfort
Trucks Save $113.50 a Day

Typical cost-cutting titles from "500 Quick Ways to Profits" November, 1938

$100 for the best cost-cutting idea

$50 for the next best

$25 for the next

Also 15 awards of $10 each
and 35 awards of $5 each
←——— for ideas like these

IN THESE EIGHT FIELDS

1. **Materials Handling, Layout, and Motion Economy**
2. **Power and Light**
3. **Mechanical Power Drives**
4. **Heating, Ventilating, and Air Conditioning**
5. **Buildings and Services**
6. **Production Planning and Control**
7. **Public and Employee Relations**
8. **Production Methods and Materials**

RULES

1. You can enter a cost-cutting idea in competition for the *Factory Awards* if you are regularly employed in the manufacturing industries. You don't have to be a subscriber to *Factory*. Your idea may be as short as you like. But it must not exceed 500 words. Send in more than one if you wish.

2. Remember the old Chinese proverb: One picture's as good as 10,000 words. If you have a photograph or a drawing that helps to make your idea clearer, let's have it. But a picture is not essential.

3. Mail contributions not later than July 15, 1939, to L. C. Morrow, Editor, *Factory*, 330 West 42d St., New York, N. Y. Winners of the *Factory Awards* will be announced in an early issue thereafter. Duplicate prizes in case of ties. Judges: L. C. Morrow, Editor; L. K. Urquhart and G. A. Van Brunt, Associate Editors.

4. All materials submitted at sender's risk. The editors reserve the right to publish prize-winning ideas, also other ideas accepted and paid for.

If other readers have beaten you to the Business Reply Cards, never mind. Just write us a note saying you want to enter

Yes. I'll send in a Cost-Cutting Idea between now and July 15. Meanwhile enter my name as a contestant for the *Factory Awards*.

Name .....

Address .....

.....

Company .....

.....

Title or Job .....

Yes. I'll send in a Cost-Cutting Idea between now and July 15. Meanwhile enter my name as a contestant for the *Factory Awards*.

Name .....

Address .....

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Company .....

.....

Title or Job .....

MAINTENANCE SERVICES

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

People and machines engaged in production must be supplied with buildings and with many services, such as electrical and mechanical power, heat, light, water, sanitary facilities, air conditioning, ventilation, dust collection, protection, communication, housekeeping. Providing these services and keeping them in condition for efficient production constitutes the Maintenance Service function. ¶ Practically every activity of maintenance service has to do with the Selection, Installation, Inspection, or Upkeep of equipment. For the benefit of FACTORY'S readers these classifications are carried at the top of the first page of each major article, and check marks are set against the classifications to which the articles belong. A fifth classification — Organization — is checked when the article deals with maintenance department organization and direction

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FACTORY MANAGEMENT AND MAINTENANCE

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

EDITORIALS

L. C. MORROW . . . *Editor*

Reanalyzing the Maintenance Function

MANUFACTURING, in its simplest terms, is the changing of raw materials into finished products. The actual physical transformation usually is called "production."

Production, as a rule, is carried on by means of power-driven machinery, so arranged that the transformation will be as economical as possible.

People operate the machinery and perform other functions directly and indirectly related to production.

Housing is provided, consisting of buildings that protect equipment and furnish comfortable, healthful quarters for people.

With this simplified analysis it is not difficult to see why management, in setting up its organization for manufacture, has said, in effect:

"Here we are, a group of people engaging in manufacture. We have machinery on which we are going to do the work, and we have buildings in which that machinery is housed.

"We'll divide our forces. This larger group of people will have the responsibility for operating the machines and seeing that we turn out a product as good as we want.

"This other, smaller group will have the responsibility for seeing that the larger group has at hand everything it needs to permit it to devote all its time and effort to actually turning out the product.

"The function of the larger group we'll call *Production.* The function of the smaller group we'll call *Maintenance.*"

Basically, manufacturing is as simple as that. In practice, it becomes complicated. The actual allocation of specific duties in a given manufacturing plant will depend upon the nature of the product and process. Principally, the complications have to do with the production function.

Maintenance remains relatively specific. The responsibilities of its personnel are:

(1) To keep the housing (buildings) in such condition that equipment always will be protected, and people will have heat, light, water, sanitary facilities, protection, and any other services that go to make up the right kind of "working conditions."

(2) To improve the housing as advanced practice in building design and construction becomes available; or as advanced practice in production makes such improvement necessary.

(3) To provide the power necessary to operate the production machines, by the most economical methods of distribution and application; and to see that there are no power failures which would interrupt production.

(4) To provide the services, normal or special, necessary to production, such as air, water, gas, oil, ventilation air-conditioning, or others.

(5) To see that the production machines themselves always are in condition to turn out product of the proper quality in the proper quantity.

(6) To work jointly with the production forces to make certain that there is available and in service at all times the handling equipment necessary to move materials through the production process at such speeds as will prevent idle time of any production equipment.

There is plenty of room for more management in maintenance and for more maintenance in management. In order to bring both about, a reanalysis of the maintenance function should be indulged in occasionally by all concerned. It still is necessary to overcome the popular conception that maintenance is "repair," and to replace it by the conception that, truly, maintenance is "continuity of production." Prevention of failure, not restoration after breakdown, must be the objective of the maintenance function if it is to play effectively its part in low-cost production.

The Need to Take Maintenance Inventory

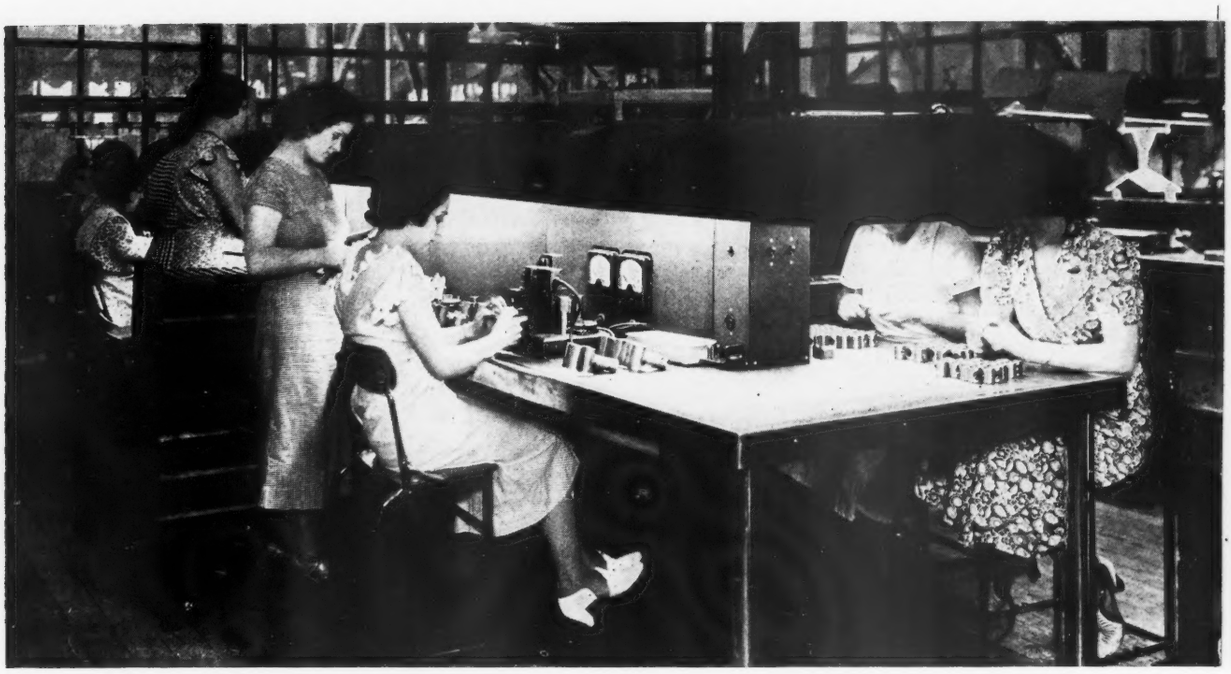
PHYSICAL INVENTORIES of maintenance parts and supplies, taken at regular intervals, help mightily to keep the plant running smoothly. They also prevent expenditures for overstocks of maintenance stores.

In production stores, minimum quantities of parts and supplies are determined which, when reached, call for re-ordering definite quantities. This procedure is reasonable insurance against shortages. Yet, as a check, physical count is made periodically.

Because of the importance of maintenance parts and supplies in preventing interruption to production, the need for insurance against shortage is as great as in production. The same procedure—minimum stores, reorders, and inventory—will provide that insurance.

The system must be based on experience records. Minimums must bear the proper relationships to quantities consumed. And minimums must change with changes in rates of consumption as production methods change, and as improved equipment is substituted for equipment of less service between failures.

There is where the practice of taking inventory periodically serves well. It acts as a check and balance in preventing both understocking and overstocking.



Long-tube mercury-vapor lamps are commonly used for overhead lighting, but here they make a delicate inspection job easier

Which Mercury Lamp Where?

GEORGE J. TAYLOR
Lighting Engineer
General Electric Vapor Lamp Company
Hoboken, N. J.

THREE MERCURY LAMPS FOR GENERAL LIGHTING

1. **Cooper Hewitt mercury vapor**
2. **High-pressure bulb, Type H**
3. **New long-tube fluorescent**

WITH THE RECENT INTRODUCTION of the fluorescent lamp, there are now available to industry three types of mercury lamps designed for general illumination—the Cooper Hewitt or low-pressure type, the high-pressure bulb or Type H, and the long-tube fluorescent. Since these lamps all have different characteristics, the question naturally arises as to where each fits best into the general scheme of industrial illumination. Before discussing this question a brief description of the fundamental differences in these lamps will be helpful in understanding their functions.

The familiar Cooper Hewitt or mercury-vapor lamp is essentially a long glass tube in which a mercury arc discharge takes place. This discharge fills the tube and is the source of the light.

The Cooper Hewitt fluorescent lamp, on the other hand, employs an invisible (ultra-violet) mercury arc to activate a fluorescent powder coating on the inside of the tube. In this lamp, therefore, the glowing powder is the light source. Both this and the other type of lamp require auxiliary equipment for controlling the mercury arc discharge. Usually this equipment is mounted directly over the reflector.

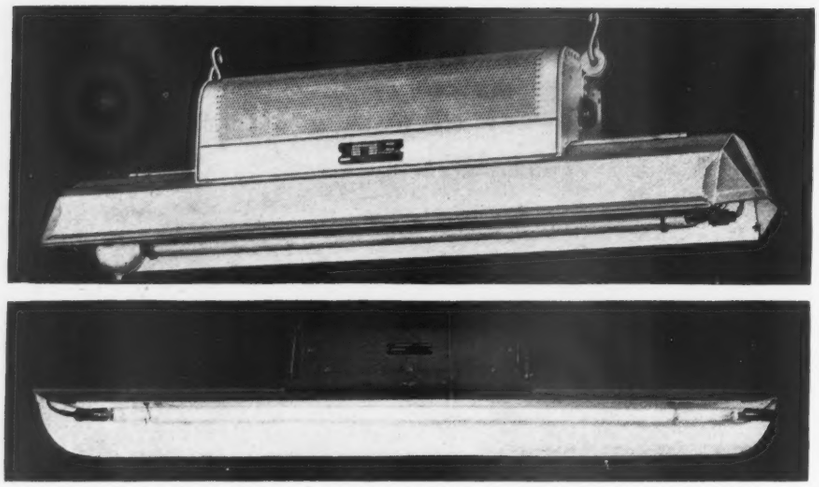
In the bulb-type or Type H-1 mercury lamp (400 watts), a highly concentrated mercury arc forms the light source. It, too, requires some kind of ballast. Such equipment, usually in the form of a simple transformer, can be located any distance away from the lamp.

The table shows the operating characteristics of these three types of lamps.

It may be said right off that none of these lamps is a cure-all for every industrial lighting problem. History of the original mercury-vapor lamp, as a matter of fact, provides an interesting analogy from which certain important conclusions may be drawn. This lamp, which has solved problems in many plants that require long-tube lighting units, was invented more than 35 years ago. Nevertheless, despite qualities that make it particularly desirable in certain applications, it has not supplanted every other type.

Explanation of this statement is obvious. Consider, for example, the typical high-bay plant where the lighting units must be mounted at a height of 30 to 40 feet above the floor. Assuming the desirability of a minimum illumination level of 30 foot-candles, even the 350-watt mercury-vapor lamp, with its wide distribution curve, could be used to produce that level only by literally covering the ceiling with them.

Therefore, in high-bay plants where the lighting units must be suspended at heights of 20 feet or more above the



Combination mercury-vapor and incandescent lamp units, above, were developed to meet the need for high intensities of color-corrected light. The 100-watt Cooper Hewitt fluorescent lamp, below, has about the same applications as the older mercury-vapor

floor, bulb-type mercury lamps are usually to be recommended. These high-efficiency light sources are used in industry principally in the 250- and 400-watt sizes. They have an operating life rating of 2,000 hours and produce at least twice as much light per watt as do commercial-type incandescent lamps.

In order to produce an illumination level of about 30 foot-candles, the 400-watt is usually installed on approximately 16-ft. centers, at a mounting height of 20 to 30 feet above the floor.

Color of the light produced by Type H lamps has been found to be satisfactory for most industrial requirements. Where color-corrected light is desired, however, combination units have been used with very good results. For example, at the Ingersoll Milling Machine Company, Rockford, Ill., combination units composed of one 400-watt Type H mercury lamp and two 300-watt incandescent lamps are used to blend the blue-green of the mercury light with the yellow-red incandescent light. The resultant color is a close approximation to daylight in quality. Economical operation is assured by the addition of two light sources, rather than the subtraction of light by filters, to obtain color correction. In this installation a uniform illumination level of 40 foot-candles is provided by these high-bay combination units, which are mounted on 16x20-ft. centers, 38 feet above the floor.

In general, low-bay areas require lighting units having a wider distribution curve than those designed for high-bay work, so that a high degree of vertical illumination may be obtained. Even though illumination levels of 30 foot-candles or more are commonly desirable, other factors than light output must be considered. It must be determined, for example, whether the necessary levels can be obtained without increasing glare and harsh shadows to an objectionable degree.

Long-tube light sources have a wide distribution curve and are well adapted to meet these requirements. Mercury-vapor lamps have inherently low unit brightness, because the light emanating from the tube is spread out over a 50-in. length. A dazzling effect results from concentration of the light source. Therefore, a diffused light source allows high levels of illumination to be obtained with the minimum of glare.

For this reason long-tube mercury-vapor lamps have been especially useful in the metal-working industry and machine shops where close inspection of small-tolerance parts is required. The Aluminum Company of America, which faces a serious problem in controlling glare, uses these lamps for the inspection of aluminum sheets and bright-finished aluminum alloys.

Shadow control is the textile industry's principal lighting problem. Proper distribution of light is highly important in the lighting of looms. Each thread end must show up clearly, while at the same time the light must penetrate in and around the warp to light the harness and other parts of the loom mechanism without confusing shadows. Directional control of sha-

Characteristics of Long-Tube Mercury Vapor, Fluorescent, Combination, and High-Intensity, Bulb-Type Lamps

	Type H-1 (Bulb)	*Mercury Vapor (Cooper Hewitt)*	*Combination Mercury-Incandescent*	*Fluorescent (Cooper Hewitt)*
Length of Light Source, In.	6	50	33	51
Rated Wattage	400	350	875 (max.)	100
Rated Bare Lamp Lumens	16,000	6,800	15,120	5,000
Lumens Per Watt	40	19.4	17.3	50
Average Rated Life, Hours	2,000	6,000	Tube, 4,000 Bulbs, 750	3,000
Average Power Factor, Per Cent	60–65 90–95*	88	99 (max.)	90
Approximate Color Value	Blue–green	Blue–green	Close approximation to daylight	Blue–white
Applications	High–bay areas; low–bay areas where levels of 100 or more footcandles are required	Metalworking, textile, automotive plants; composing rooms; inspection departments	Color work; textile shading; drafting rooms; inspection departments	Metalworking, textile, automotive plants; inspection departments

*High power factor transformer

dows, to provide contrast along each thread, has been effectively secured with a long-tube light source mounted parallel to the direction of the ends.

Combination mercury-vapor and incandescent lamp units were developed to supply the need for a color-corrected light in certain applications. In the textile field, weaving, inspection, and shading of colored fabrics must be done under a light source that provides illumination simulating daylight as nearly as possible. These combination units employ a mercury-vapor tube and incandescent lamps in one fixture located above an angular channel of diffusing glass. Blending the output of the two light sources produces a synthetic daylight effect.

Twice as Many Units

The new 100-watt, Cooper Hewitt fluorescent lamp has essentially the same application possibilities as the older mercury-vapor lamp. A superficial comparison of the two lamps might seem to indicate that the new lamp will prove to be more economical than the other. No general rules can be laid down at this time, however, because it must be remembered that in order to obtain equivalent levels of illumination a larger number of fluorescent lamps is required. Despite the high efficiency of the fluorescent lamp (50 lumens per watt), its total output is less than that of the long-tube mercury-vapor lamp. Roughly, lighting of equal volume to that supplied by the mercury-vapor lamp requires approximately twice as many fluorescent units.

In other words, to obtain an illumination level of from 30 to 35 foot-candles, fluorescent lamps should be spaced on 8-ft. centers, at a height varying from 10 to 12 feet. Thus the initial cost may be expected to be somewhat greater, and the operating economy obtained must be determined for each installation before a choice is made between mercury-vapor and fluorescent lamps.

The fluorescent lamp provides evenly distributed light with directional control of shadows. It has an output of 5,000 lumens, and operates at 90 per cent power factor. Using a full-wave, rectifier-type circuit the lamp will burn on an a.c. supply without flicker or stroboscopic effect. The light is of blue-white color, containing enough red to render all colors sufficiently pronounced for industrial purposes.

Auxiliary electrical equipment is contained in a dust-tight compartment, making the unit adapted to use in dusty or lint-laden atmospheres.

The greater output of the long-tube mercury-vapor lamp, however, probably will make it a preferred light source in various industries. In many plants it will be difficult to obtain the necessary levels of 50 or more foot-candles more economically than with this unit. Therefore, it seems safe at present to predict that comparatively little change may be expected in lighting practice in fields where mercury-vapor lamps have been generally used, unless it be in gradually increasing illumination levels.

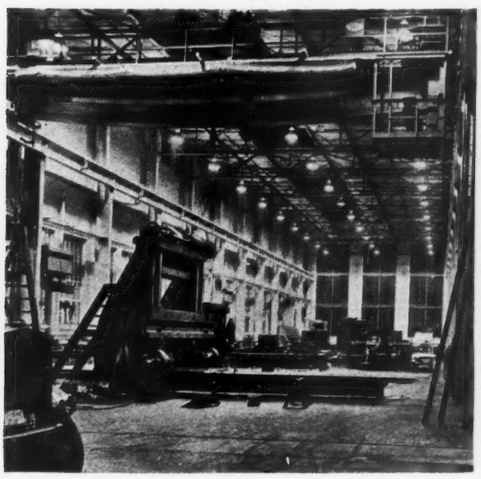
The first plant installation of long-tube fluorescent lamps is now nearing completion. The windowless plant of the Simonds Saw and Steel Company, Fitchburg, Mass., is to be lighted by some 1,500 units, representing one of the most up-to-date lighting installations in the country.

Suggested layouts compiled by lighting engineers for all types of plants must necessarily be regarded only as a starting point in designing a lighting installation, regardless of the light source to be utilized. In practically every type of lighting installation the spacing must be flexible, depending on the particular requirements of the plant. In textile mills, for example, work on colored fabrics may require twice as much illumination as is needed for white materials. In some metal-working plants the safety problem may require higher illumination levels than in others. Again, the construction of the plant often requires modifications of customary layouts to obtain recommended levels of illumination.

Fit the Lighting to the Job

Adequate lighting can seldom, if ever, be obtained from a set of specifications for lighting units, lamp-spacing layouts or even foot-candle levels, if the installation has not been engineered to fit the needs of the individual plant and its operating conditions. For every generality that has been given here, an example may be cited of a well-lighted plant that has reached its goal by different methods.

In the final analysis determination of the proper lighting installation for any plant should be preceded by consultation with an experienced lighting engineer. Reasonable assurance is thus provided that no important factor peculiar to that particular plant will be overlooked.



A high bay at the Ingersoll Milling Machine Company, is lighted by combination units containing one 400-watt Type H mercury lamp and two 300-watt incandescent lamps. Spaced on 16x20-ft. centers, 38 feet above the floor, they provide an intensity of 40 foot-candles. A test installation of 100-watt fluorescent lamps, right, on 10-ft. centers, 10 feet high, provided 30 foot-candles

12-Step Inspection of Controls

A. E. WINDLE
Plant Engineer
Colgate-Palmolive-Peet Company
Jersey City, N. J.

A. E. Windle was born at Brockton, Mass. Was graduated in Mechanical Engineering from M. I. T. During the World War he did his bit as Engineer Officer in the U. S. Army Air Service. Since shedding his uniform he has served as plant engineer, International Time Recording Company; superintendent of equipment, Tide Water Power Company; assistant plant engineer, Corning Glass Works; plant engineer, Wilbur-Suchard Chocolate Company; plant engineer, Kroger Grocery & Baking Company. He will pass up a good dinner any time to match his wits and skill against any fresh or salt water fish that's willing to take a chance.

FREQUENT INSPECTION of all control equipment is the best safeguard we know of against trouble and the consequent interruptions to production. That is why our inspection schedules have been carefully worked out and are rigidly followed, despite the fact that the control equipment in our Jersey City plant is comparatively new.

Until about four years ago most of our motors and controls were of two-phase, 25-cycle design, installed many years ago. Work of changing over the entire plant to a 440-volt, three-phase, 60-cycle system was started about five years ago and completed last year.

At present there are upwards of 1,150 motors in operation. They range from fractional-horsepower to 75-hp. rating. The majority are of 5- to 30-hp. size. About 60 wound-rotor motors are in use; the remainder are the squirrel-cage induction type.

Motors up to 7½-hp. rating are controlled by across-the-line starters. For those of higher rating we use compensators. Across-the-line starters and compensators are for the most part controlled by pushbuttons, although in some places manually operated compensators are used.

Pushbutton control is preferred for most applications because: (1) It is more convenient for the workers, many of whom are women; (2) abuse of equipment is prevented; (3) starters can be mounted in any location.

In the manufacture of soaps, toilet powders, and similar products a certain amount of dust is produced in some of the processes. In other departments equipment must be protected against splashing liquids, or considerable amounts of steam and moisture. Dustproof inclosures are therefore used for the controls in some areas. In the perfume department the presence of highly volatile fumes makes the use of explosion-proof controls and other equipment necessary.

With this background of our conditions it will be easier to understand what some of our control maintenance problems are, and the reasons for the procedures adopted to meet them. As experience or changing conditions indicate the need for alterations in our inspection schedules, we make them. At present, however, certain motors and their controls are inspected at least once a week, others at intervals of two weeks, and some once a month. A few units are allowed to go for longer periods.

We have found it advisable to treat a motor and its control as a unit and inspect both at the same time. Also, it is our practice to assign only qualified electricians to this work. An experienced man will at once detect abnormal conditions that would utterly escape the notice of a less well-seasoned workman.

Incidentally, the electrical inspectors are shifted from the day to the night gang and back again according to a regular schedule. As a rule, each man works two weeks on each shift in turn. As a result they obtain the widest

THE TWELVE STEPS

1. **Remove all dust and dirt**
2. **Examine contacts and dress or replace if necessary**
3. **See that all connections are tight**
4. **Remove dirt from polepieces of magnet**
5. **Check sealing of armature**
6. **Inspect overload devices and check setting**
7. **If contactor is noisy, examine shading coil**
8. **Check hinges for freedom, and excessive wear**
9. **Test magnet coils, by operating, for open or short circuits**
10. **Drop tank of compensators and inspect contacts and oil**
11. **Inspect interlocks; lubricate**
12. **Check pushbuttons, contacts, springs, connections**

possible training and experience, and do not stay in one department long enough for the work to become monotonous. That is a more important matter than one might think, because monotony frequently tends to develop carelessness.

Insist on Thorough Check

Details of the procedure followed by an inspector when examining a control are simple enough, but we insist that all necessary checks be made, and made carefully. For example, usually after opening the box the inspector first removes any dust that may be present. This is done by blowing out with compressed air, or by means of a small portable blower.

Contacts are then examined for evidences of arcing, as indicated by roughness, burning, or pitting. Excessive roughness is smoothed down with a file. If contacts are badly worn or burned, they are replaced.

All connections are checked, to make sure that the screws are tight.

Magnet faces are carefully cleaned of all dust. Dust produced in some of the departments tends to absorb moisture and become sticky. If it is allowed to remain on the polepieces, the armature may literally be glued to them, and the contactor will refuse to open. Following this test, sealing of the armature is checked to make sure that the air gap is not excessive.

Overload devices next receive attention. They are inspected carefully, particular attention being paid to the spiral strip used in some of our control devices to determine whether or not it has returned to the zero position, after operation.

Hinges are checked for freedom of motion and for excessive looseness.

Sometimes the shading coil in the face of the magnet becomes open-circuited. This condition makes a contactor noisy; therefore, it can easily be detected merely by listening.

Open- or short-circuited magnet coils will reveal themselves by faulty operation or failure of the contactor to close.

The foregoing refers, of course, particularly to air-break switches. Substantially the same routine is followed with compensators. That is, the mechanism is thoroughly cleaned and all parts including connections are checked for proper condition. Particular attention is paid to the overload devices. Some of our compensators have a dashpot overload relay. The condition and operation of the dashpot are carefully checked and any needed adjustments made.

Then the oil tank is dropped, and the contacts are inspected. Any that need dressing or replacement are attended to at once. The oil is examined at the same time and replaced if it is very dirty.

On certain applications several motors must be started in the proper sequence, and to prevent errors the controls for these motors are interlocked. All such interlocks are inspected carefully.

Pushbuttons, too, are gone over at the same time as the starters. Dust is blown out and the condition of contacts, springs, and connections is checked. Poor contacts, or buttons that stick, can cause a good deal of trouble, and we watch out for them.

Inspecting Drum Controllers

Drum controllers used with the wound-rotor motors are examined once a week. The contacts are subject to rather rapid wear and a good deal of copper dust is formed. This dust is carefully removed from all parts by brushing and wiping them with a cloth. Here, again, the inspector makes sure that all connections are tight, dresses rough contacts, replaces any that are badly worn, puts a thin film of light lubricating oil on the fingers, and makes a general check of the operation.

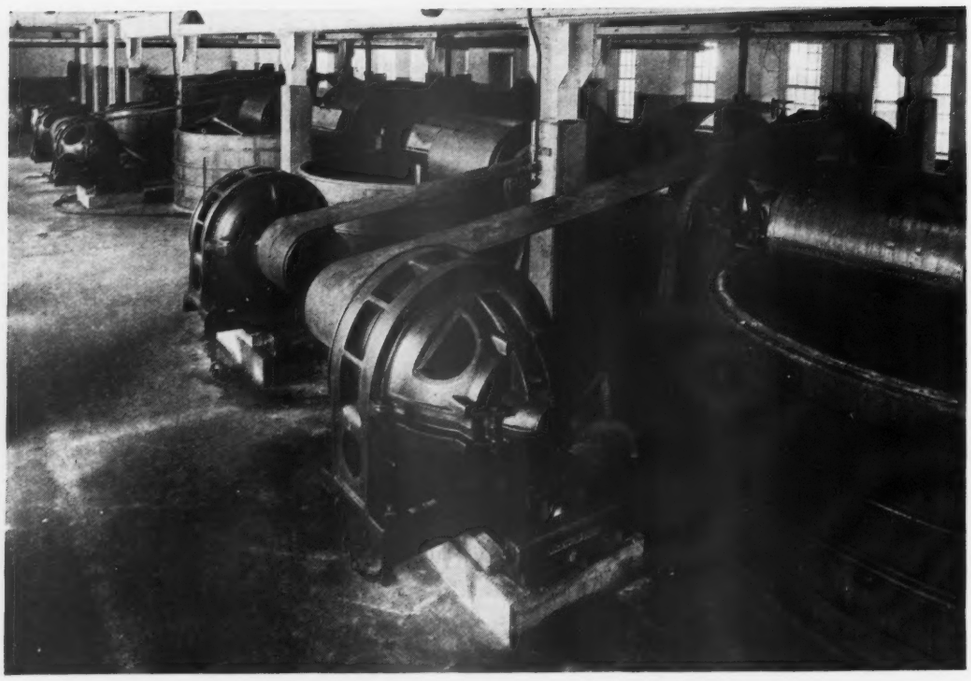
Following this inspection he examines the resistance used with the drum controller for loose connections and broken grids.

After the inspector completes his work on each control, regardless of the type, he closes the box with a small seal similar to those used with kilowatt-hour meters, to keep meddlers from opening the boxes.

It will be apparent from what has been said before that inspectors make immediately whatever minor repairs or adjustments they find are needed. When it is discovered that major repairs are required the inspector reports the nature of the repairs or trouble in writing to the chief electrician.

A card is kept in our equipment file for each motor and control. On it are noted the nature, cost, and date of all repairs. Aside from giving us an accurate record of the performance and cost of maintaining each control and motor, these cards have been of much help in the formulation of inspection and maintenance schedules, by showing which units give the most trouble.

One of the inspectors checks up the starter for a 40-hp. motor driving a crutcher

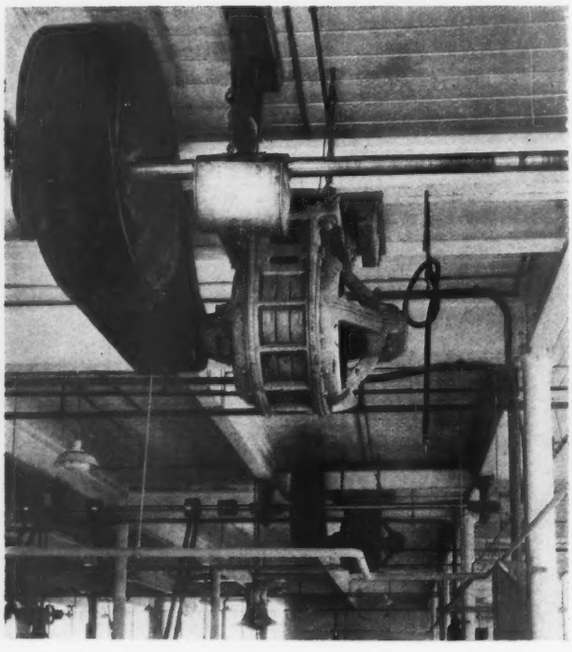


Four 100-hp. motors on floor-type pivoted bases were selected to drive these beaters in a paper mill

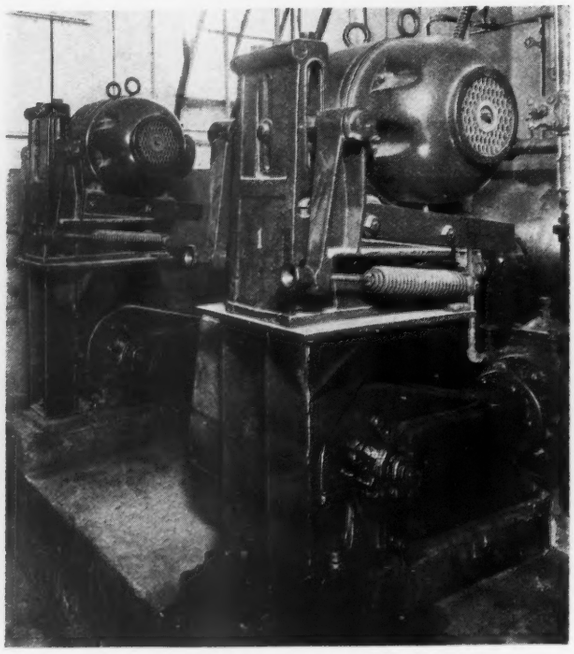
7 Drive Problems and 7 Solutions

All by the Pivoted Motor Base

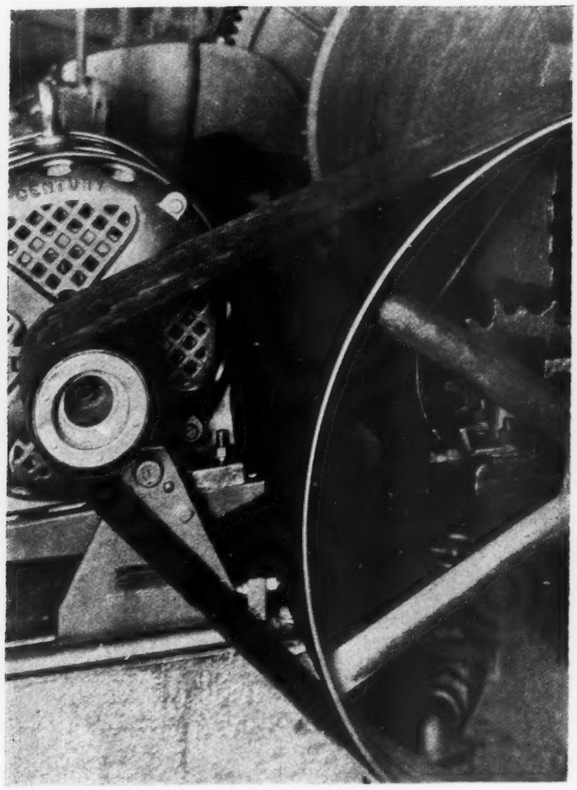
Textile mill lists uniform belt tension and longer belt life as chief benefits from ceiling-mounted pivoted-motor drives



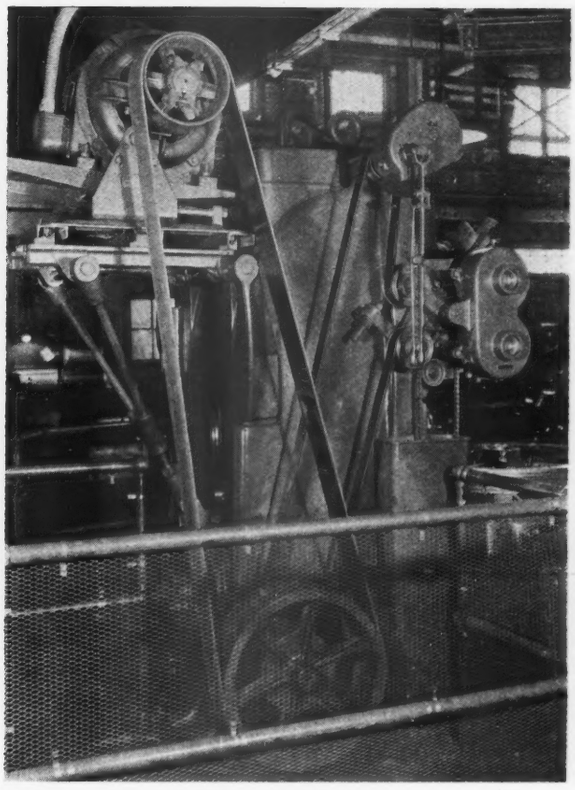
Gas compressors in West Coast glass plant are driven by motors mounted on a vertical base of overhead-drive type



Photographs on this page from Rockwood Manufacturing Company

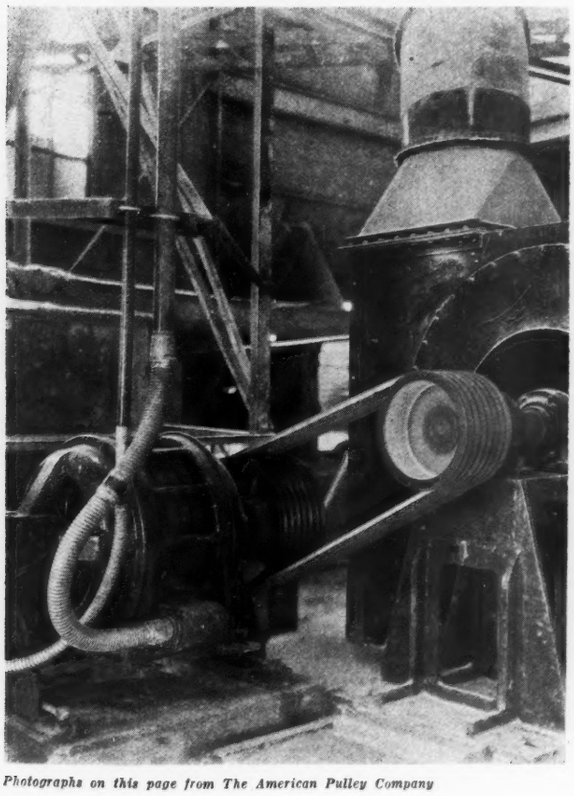


Tension regulating base on a tumbling barrel drive provides the answer to high starting inertia and pulsating shock load

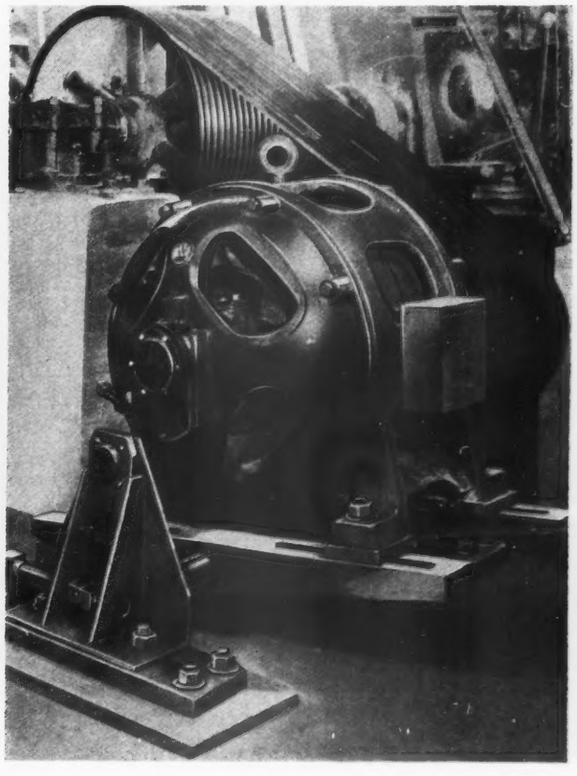


Down-drive base for 25-hp. motor makes it possible to enjoy benefits but avoid headaches that go with vertical drives

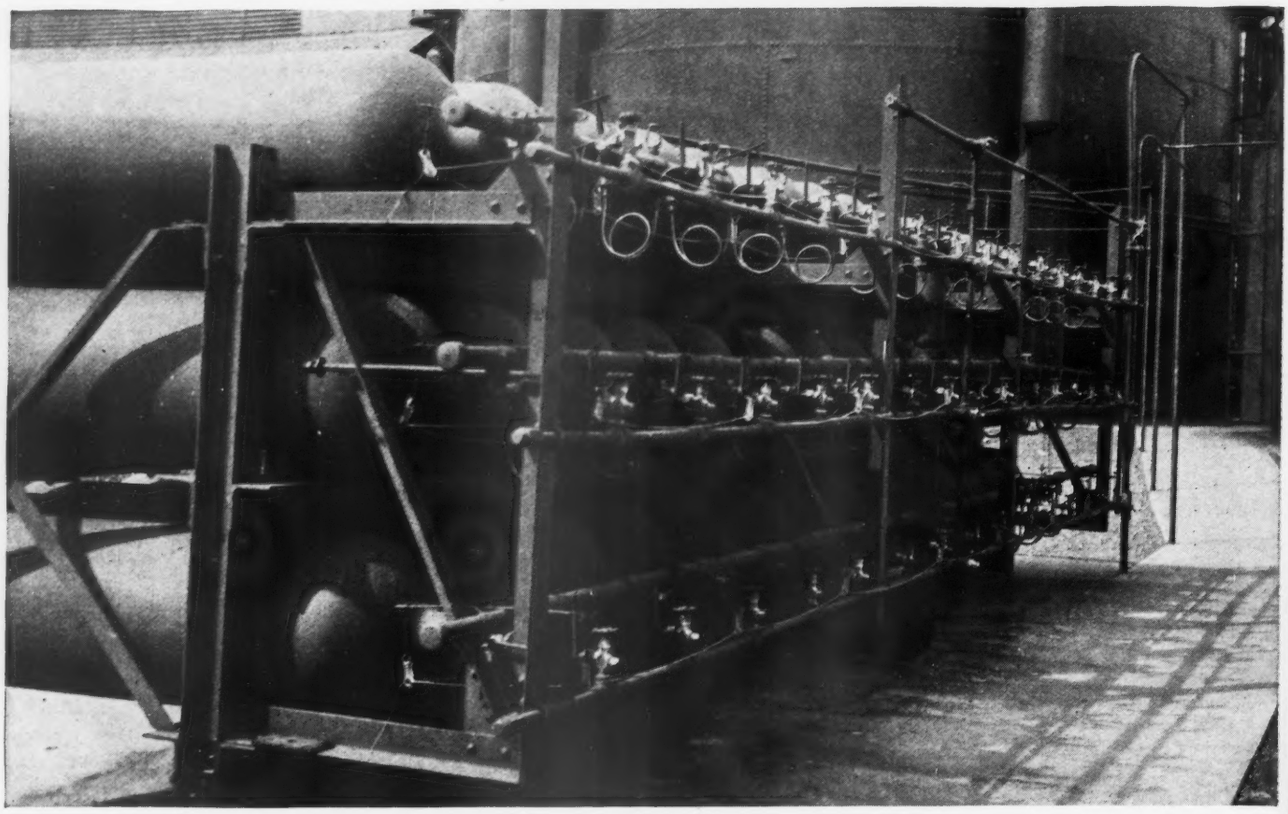
Savings in maintenance service cost and replacement expense soon paid for the tension control base on this big fan drive



Here the pivoted base cuts average belt tension 31 per cent, assures longer belt and bearing life, less power consumption



Photographs on this page from The American Pulley Company



One Hydrogen Fire Was Enough

W. D. BULLARD
Engineer, Associated Factory Mutual Fire Insurance Companies, Boston

RCA's PROBLEM

To protect 42 high-pressure hydrogen cylinders with a combined capacity of 50,000 cubic feet of free gas

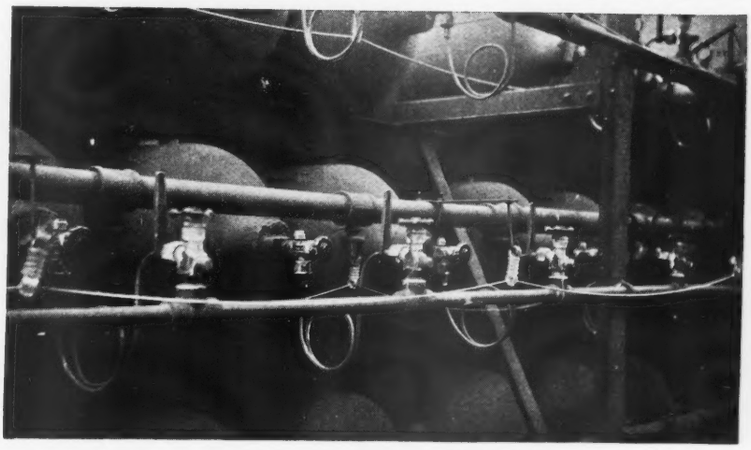
RCA's SOLUTION

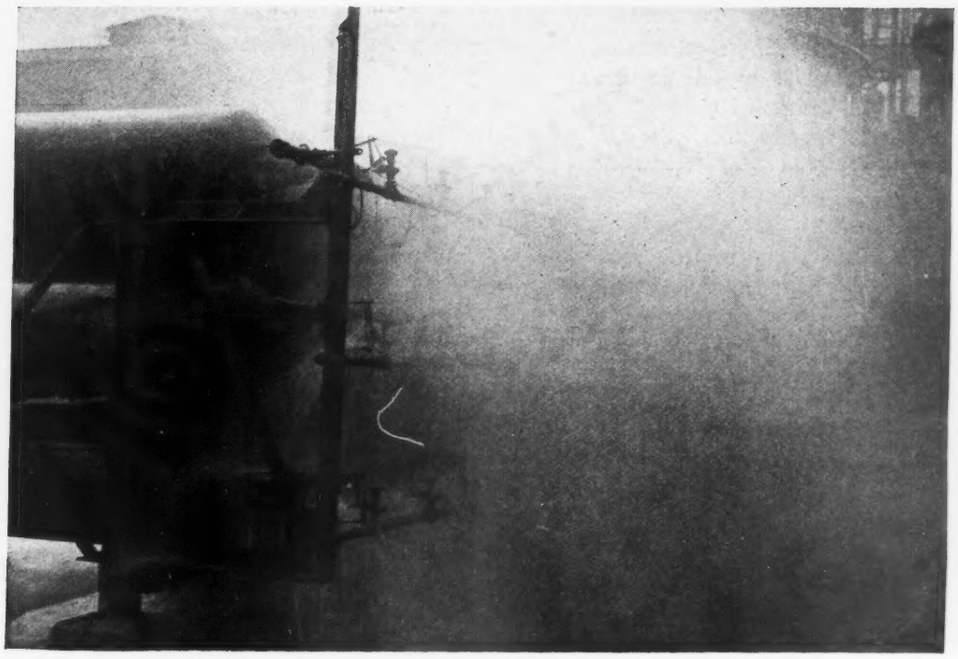
Automatic sprinklers with links removed, between the head of each hydrogen cylinder and the manifold piping

PROVIDING FIRE PROTECTION for a battery of hydrogen cylinders at the plant of RCA Manufacturing Company, Harrison, N. J., brought up several important problems. They were eventually solved by the installation of a large number of sprinklers with the links removed, and an alarm circuit containing fusible wire. Although this installation was designed to meet special requirements, the general principles followed may be useful under other unusual conditions.

Outdoors and well back from main buildings in this plant, 42 high-pressure (2,000 pounds per square inch) hydrogen cylinders with a combined capacity of 50,000 cubic feet of free gas are arranged horizontally in three tiers of fourteen each, in a steel framework. All cylinders are connected to a mani-

An open sprinkler is located between the head of each cylinder and the manifold. Supported on glass insulators, one line of weatherproof fusible wire runs along the manifold, another close to the cylinder valves, and a third between the cylinders and a brick wall protecting a wooden building. In case of fire, fusing of the wire opens a circuit and operates a relay, ringing a gong in a nearby building. Men are continuously on duty there, can immediately turn on the control valve, and put the sprinklers into action. On facing page, battery of hydrogen cylinders. Right, close-up of protection system





When the sprinklers go into action, they discharge about 1,200 gallons of water per minute, producing the appearance of an impenetrable fog or pea soup mist

fold and are permanently in place, but those that need repairs may be removed by closing a valve at the head of the cylinder and another one beyond it, in the manifold.

Formerly there were no valves at the cylinders; before a cylinder was removed from the line its pressure was reduced by allowing the gas to blow off into the atmosphere. But one morning employees unscrewed the connection from the manifold, whereupon the escaping hydrogen ignited, probably from a static or friction spark. The flow of gas could not be shut off, since there were no valves between the cylinder and the manifold valve. Heat from the burning hydrogen melted the lead packing of nearby valves on the manifold, fusible plugs, and connections at other cylinders, and the escaping gas at these points further intensified the fire.

Water or chemicals will not extinguish such a blaze, but the mill fire brigade used two large hose streams and three small ones as effectively as possible to keep the tanks, piping, and valves cool. As the intensity of the fire decreased, an employee with his hand wrapped in a wet towel and protected by hose streams, advanced along the manifold and closed the valves.

When the fire eventually burned itself out some 45 minutes later, eight of the twenty cylinders then in service, as well as manifold equipment, were damaged.

Because it was evident that a large volume of water is necessary to confine a fire in the hydrogen storage, a test was made in cooperation with plant officials to determine the most practical method of applying water effectively to the heads of the cylinders and thereby protecting them from damage if a fire occurred at the manifold. As a result, a system of 42 automatic sprinklers with the links removed was installed. One sprinkler is located between each cylinder and the manifold.

Weatherproof, fusible wire is supported in insulators beside the cylinder valves, along the manifold, and on the side of the brick wall between the battery of cylinders and a wooden building. When a fire occurs, fusing of the wire by the heat opens a circuit and operates a relay, ringing a gong in a nearby building. Men are continuously on duty here and can turn on the control valve immediately, putting the sprinklers into action.

A Plant Is No Better

FREDERIC OAKHILL
Mechanical & Maintenance Engineer
United Wall Paper Factories, Inc., Chicago

TED OAKHILL, the well-maintained gentleman on the facing page, has been out in industry for 20 years, and doesn't begin to look it. Which makes him a sort of walking ad for his chosen profession. He got his first smell of powder in the meter department of the Kansas City Power & Light Company, has been in the front-line trenches ever since. He stayed in KC 3½ years, then went to Chicago Bridge & Iron Works as a structural steel draftsman, getting a good taste of fabrication and erection work during his 6½ years on the job. His next connection, with Bauer & Black Division of the Kendall Company, lasted 9½ years. There he was in charge of all physical property, its operation and maintenance. Which brings him right down to March 27 last, when he started his present job. Oakhill writes an occasional article in his field, speaks now and then at society meetings, lectures at Armour Institute

A PLANT IS NO BETTER than its maintenance. That is a rather extensive claim, I admit, and calls for a definition of maintenance before it will be agreed with. So what *is* maintenance?

Maintenance is the summation of those activities involved in the consideration and solution of the problems pertaining to the physical plant and equipment, their design, construction, operation, and upkeep.

The editors of FACTORY refer to the total of those activities as "Maintenance Services." Some plants use the simple term "Maintenance." I prefer the term "Plant Engineering."

Real plant engineering begins, before any piece of equipment is purchased or installed, with the selection of the man who is to head up the work. The industrial executive who considers himself worthy of his title does a thorough and conscientious job of selecting a man to be the comptroller or treasurer of his organization. The same kind of job should be done when he selects a plant engineer or a superintendent of maintenance.

The average person needs competent medical aid to keep well so that he can function efficiently. An industrial plant is in need of competent technical aid if the machinery is to be kept running day in and day out. "How soon can the broken down machine be fixed?" is not the most important question in maintenance. With the proper Plant Department organization, machinery just does not break down enough to cripple production activities unless someone throws a monkey wrench in the works.

Any business large enough to hire one man to handle the plant engineering problems of the plant should create a Plant Department in which the functions of building services, power plant operation, plant mechanical services, and plant electrical services will be coordinated.

The Plant Department, by the very nature of its responsibilities, becomes a vital link in the entire manufacturing process of the business, because it is obvious that the plant must be kept in an operative condition if it is to produce a product. All too many times the Plant Department is considered more as a necessary evil than a valuable adjunct to the business.

No Oil-Can Mechanic Need Apply

In any company where machinery is the basic means of manufacturing the products sold, the Plant Department should rank equally with the Production Department. In fact, the value of a Plant Department can well be appraised by the fact that some industries require more people in this department than they do in the Production Department. One man can readily control the operating mechanism of a large machine, but to maintain the machine in proper running condition usually requires the partial attention of several highly skilled mechanics.

No business can afford to take the attitude that plant maintenance can be carried on successfully by hiring a handy man, dressing him in overalls, giving him an oil can and monkey wrench, and saying: "Well, my boy, here is our plant—it is now your job to make it run each day and keep the squeaks out of the machinery."

A little from the beaten path of normally conceived ideas of maintenance is the subject of building upkeep or service. Anyone can hand a broom, a mop, and a pail of water to an individual and say: "Keep the floors clean." However, when one considers the very close margin of profit enjoyed by the average company, the need for telling just how even cleaning jobs are to be done becomes apparent.

Another illustration: How many untrained persons realize the dollars and cents thrown away by permitting electric light bulbs to become dirty and stay that way? A trained Plant Engineer or Superintendent of Maintenance would know that he can effect real economies by giving attention to the small, but often overlooked, opportunities for savings.

Sometimes I think the Chinese have the right philosophy, in paying the doctor only so long as they remain well, and collecting from him when they become sick. In the same manner a company with a smooth-running, efficiently operating plant can well afford to maintain a properly organized Plant Department. When a plant is constantly requiring breakdown repairs to machinery during production hours, the

Than Its Maintenance

Plant Department is not paying its way. The "oil-can" mechanic and repair man, employed by many industrial plants because they don't pay enough to secure skilled and competent individuals, is not in a position, by inclination or training, to comprehend fully the value of such so-called "paper" work as budgeting and budgetary control of expenditures, and planning and scheduling of work.

Control of Plant Department activities will assure a minimum amount of interference with production processes. Our oil-can mechanic is interested primarily in doing physical work normally required, and anything that interferes with the performance of this work is usually looked upon by him as unwanted business. Friction of personalities on this account is not uncommon where the repair men operate as lone individuals, reporting now and then to some supposedly superior directing supervisor.

Yes, good plant engineering begins long before any actual physical construction takes place. Just because a plant is running does not necessarily mean that it is being properly engineered and maintained. The final objective of good plant engineering should be to have the plant running continuously throughout the production day at an irreducible minimum of operating cost. This standard is one of almost perfection, but an appreciable realization of this goal can be had when top management gives to these activities their proper respect and engages the services of men competent to perform the necessary work.

For Cheap Power, Small Turbines

A. O. H. GRIER, JR.
Turbine Application Engineer
Westinghouse Electric & Manufacturing Company
South Philadelphia, Pa.

THERE ARE IN AVERAGE industrial plants many applications of prime movers which can be filled to the best advantage either by small steam turbines or by small turbines in conjunction with electric motors. In this article we shall consider turbines up to about 500-hp. rating.

Operating conditions, the number and requirements of the manufacturing processes, and the location of the plant with respect to fuel, water, and electric power supply are major factors in determining the type of prime mover to be employed in each case.

A plant with low-cost fuel and water probably can make a considerable saving with turbines even though they exhaust to atmosphere. If all or part of the exhaust steam is used, a turbine will give low over-all operating cost.

When a plant has high fuel costs but requires considerable low-pressure steam, a turbine very likely will be the most economical means of driving individual machines.

Where all the exhaust steam can be used in process work, the turbines serve as a reducing valve, and power is obtained as an inexpensive byproduct.

They Keep Going

Any plant that would suffer an abnormal loss if the operation of vital equipment were interrupted, may well consider using turbines. Since operation of a steam turbine is dependent only on a continuous supply of steam, the source of which can be made very reliable, it is commonly accepted as the most dependable drive. In some instances turbines have operated without interruption during flood conditions, although practically submerged.

To insure against the interruption of service, a turbine frequently is used in conjunction with an electric motor for driving either the same or duplicate machinery.

The kinds of equipment commonly driven by turbines include; pumps, fans, blowers, compressors, generators, paper machines, jordans, shredders, stokers, beaters, dryers, evaporators, and centrifugals.

For steam economy it is desirable to operate a turbine at the highest practicable speed. Where the speed of the driven apparatus is relatively low, reduction gears can be used to good advantage. Units with gear ratios from 2 to 1 to about 14 to 1 are available. Gear efficiencies usually are 98 per cent or better.

If required, a gear shaft suitable for connection at both ends can usually be supplied so that it can be made an integral part of a lineshaft, rather than being restricted to connection at one end or the other. Close-coupled turbine-gear units are available in the smaller ratings. They combine compactness with simplicity, due to the omission of one bearing and the use of smaller bearings.

When selecting a turbine for a given application it will usually be found, as stated before, that a high turbine speed is desirable, when steam economy is important. However, where exhaust pressure is high, a condition which produces higher internal losses, the highest speed obtainable may not be the best one for the application. A few trial calculations at different possible speeds and with different sizes of turbine wheels will be required to determine the most economical turbine wheel diameter and speed combination for the conditions.

SMALL TURBINES HAVE THESE ADVANTAGES

1. Initial cost is not excessive

2. Expensive foundation is not required

3. Operating and maintenance costs are low

4. They are simple, rugged, and almost foolproof

5. Operation is quiet

6. Starting and running torques are constant and smooth; the starting torque is always greater than the full-load torque and can be increased materially by the proper use of steam control hand valves

7. Continuity of service is maintained under adverse conditions

8. They are inherently free from fire hazards

9. Exhaust steam is not contaminated by oil or other impurities chargeable to the turbine

10. A speed changer can be provided to vary the speed in an infinite number of steps over a generous range

Advantages of Dual Drives

It is customary to drive generators up to 50-kw. rating at 3,600 r.p.m., and those of 75-kw. rating and above at 1,200 r.p.m. Therefore the turbine is either direct-connected or geared to the generator, depending on the rating.

Employment of both a turbine and a motor either in a dual-drive installation, in which both drive the same piece of equipment, or in a complementary-drive installation in which each drives identical equipment, makes a flexible, reliable, and desirable application. Either of these arrangements can be made to serve well both the heat balance requirements and the basic requirement of continuity of service. Ability of both the turbine and the motor to maintain a constant speed under constant operating conditions, and the facility with which steam flow to the turbine may be varied to meet fluctuating conditions of either load or low-pressure steam demands, makes possible very close control of either the load on turbine and motor or of amount of exhaust steam obtained.

In a dual-drive application where all

the exhaust steam can be used constantly, or the exhaust steam demands remain fairly constant, the turbine's performance is usually controlled by a speed changer.

The turbine full-load speed is set equal to or slightly higher than the motor no-load speed. Then by varying the steam flow by means of the speed changer, the total load can be divided as desired between turbine and motor to supply the required exhaust steam. The motor is always ready to take over the entire load if the turbine permits the driven unit's speed to fall to the motor's full-load speed.

Maintains Constant Pressure

Frequently in a dual-drive application the demand for exhaust steam fluctuates constantly. In such cases the amount of steam admitted to the turbine, and consequently the proportion of load carried by it, is controlled by an exhaust pressure regulator instead of a speed changer. This regulator controls the steam flow so as to maintain the exhaust pressure approximately constant. If it is desired to have the turbine take over the entire load in the event of electric power failure, a solenoid is provided which renders the exhaust pressure regulator inoperative and puts the turbine under full control of its governor. Then the exhaust steam flow will, of course, depend solely on the load carried by the turbine.

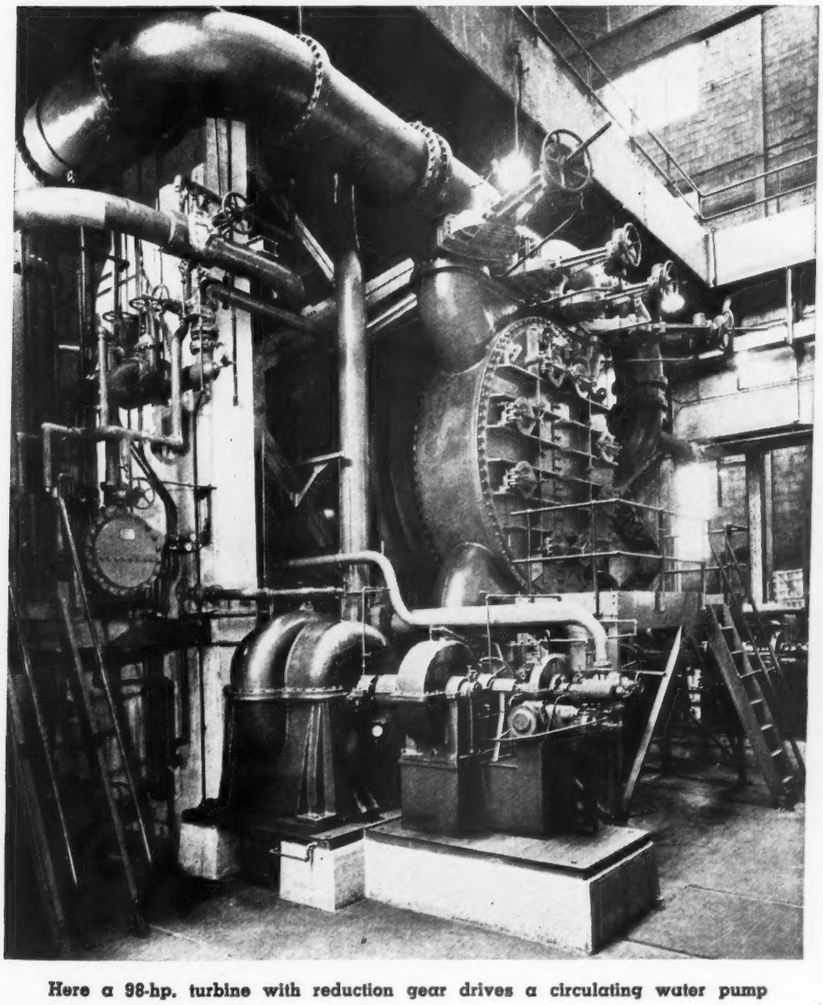
In another type of dual-drive application no exhaust steam is required and the turbine idles at normal speed as a standby. Such applications usually require the full-load turbine speed to be the same as the full-load motor speed when the turbine takes control in an emergency. Usually a solenoid-operated valve in the steam line controls steam flow to the turbine. This type of valve is normally kept closed, but is opened wide upon failure of electric power. This means, of course, that the turbine takes full load almost instantly, upon failure of the power supply. It has been found that a turbine can be depended upon to give good performance in such service.

When a turbine drives a small a.c. generator either to give any amount of exhaust steam up to a maximum, or as a source of power in time of emergency, the complete unit can be floated on the power lines. The turbine then takes over the total load when failure of electric power permits the speed of the unit to drop below normal. Under the worst conditions full-load speed should not fall more than 5 per cent below the speed maintained by the generator when it is merely floating, or idling, on the power line.

If necessary, provision can be made for readjusting the turbine speed to the normal full-load generator speed. Of course, where no exhaust steam is required, steam supplied to the turbine can be regulated by a solenoid-controlled valve which opens wide on failure of power to the generator. For such operation the turbine governor is set to give the normal full-load speed required when it comes into operation.

Turbines driving pumps can be controlled by constant-pressure or by differential-pressure pump regulators to give either a desired discharge pressure or a pressure relative to that in a boiler or storage tank.

When turbines drive fans, blowers, and so on, regulators are normally used to maintain approximately constant discharge pressure. These regulators exercise control by varying the steam flow to the turbine.



Here a 98-hp. turbine with reduction gear drives a circulating water pump

Consider the Location

When preparing specifications for a turbine, it is important to consider the location of the turbine with respect to other apparatus, and the effect of the length of inlet and exhaust pipes on the initial and exhaust steam conditions at the turbine. In most instances it is possible to obtain hand valve control of the nozzles. By the proper use of such control the operator can obtain the best possible economy at certain partial loads as well as at maximum under the normal steam conditions. There is also assurance of having the maximum capacity required, at fair economy, when abnormal steam conditions exist.

It is not necessary to build an elaborate foundation, although it must be adequate for the weights and forces encountered. The piping required is simple and if properly arranged and drained, will not be the source of water leaks or other annoyances. A suitable expansion joint provided at the exhaust connection is a material aid in maintaining alignment of the turbine.

Measurement of insulation resistance with a Megger (James G. Biddle) is part of this inspector's routine in checking up the condition of motors

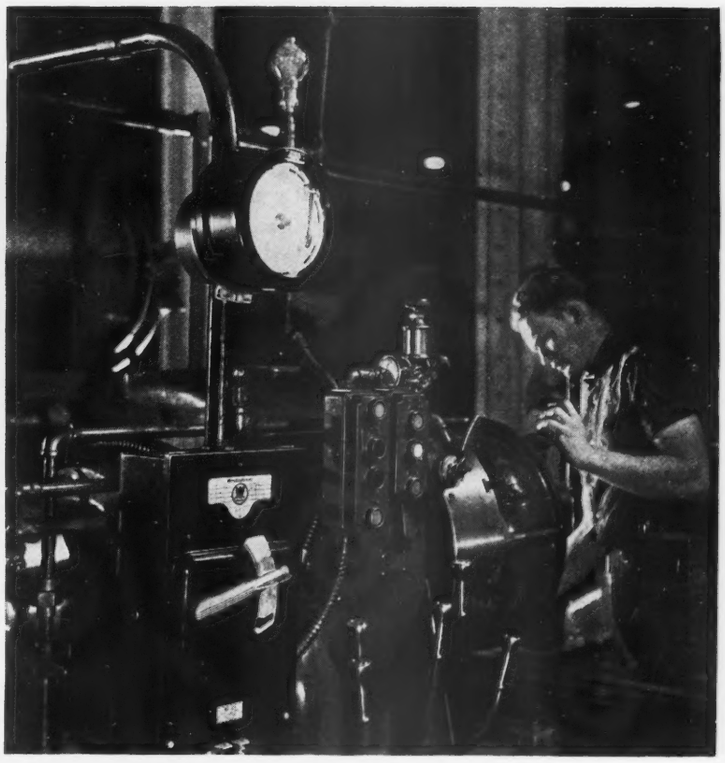
Up on a pole, it's no trick at all to slip a clamp-type ammeter (Columbia Electric) over one of the primary leads of a 4,600-volt transformer and measure the current

METERS

Do These Jobs for Industry

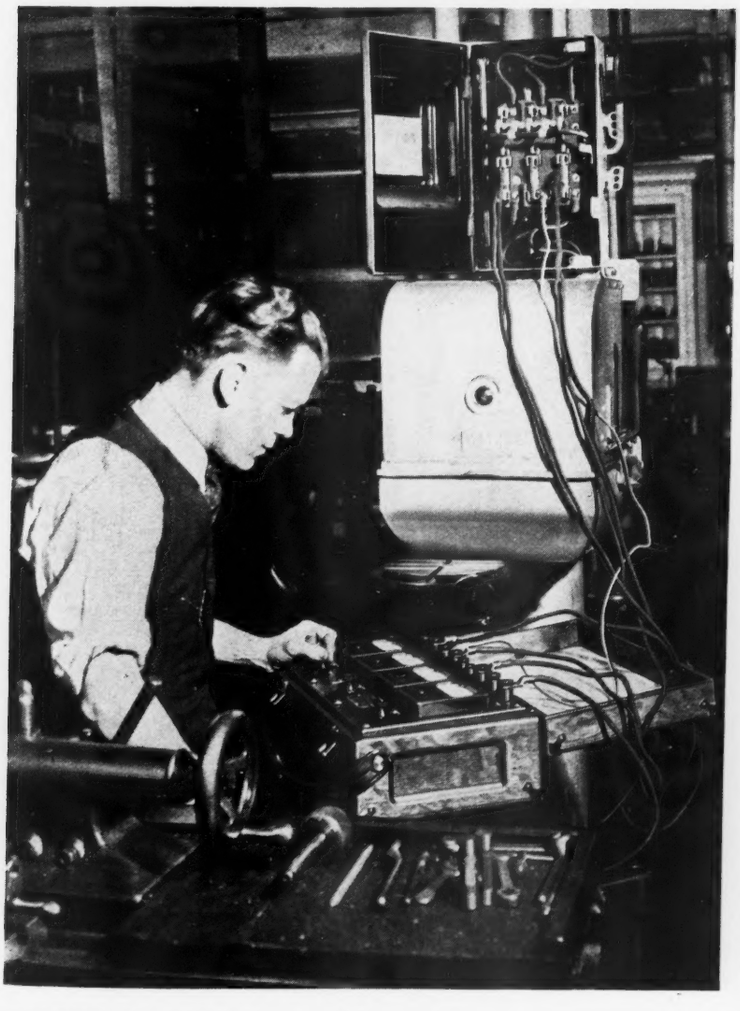
How's your voltage? A glance at the chart of this recording voltmeter (Bristol) will answer that question for every minute of the day, or night

It takes only a moment to check a large motor (above) for phase balance with a clamp-type ammeter (Ferranti)



(Above) Usually a plug-in ammeter (Westinghouse) warns the operator of overloads, but right now a graphic instrument is getting information needed by the Cost Department

(Below) Getting voltage, amperes, watts, and power factor all out of one box (Weston) simplifies the job of checking motors and making plant surveys



Meters (General Electric) tell everything about this electric furnace (below). On top, at the left, a voltmeter; between them, a watthour meter measuring radiation losses; right, an ammeter. In the center, a time meter, recording hours of operation. Below, a time switch which turns power on and off automatically

Split Maintenance 15 Ways

A big plant cuts upkeep costs nearly 15 per cent by dividing the maintenance force into groups placed at strategic points

L. C. HILL
Manufacturing Manager
The Murray Corporation of America
Detroit

REORGANIZATION and decentralization of our maintenance service activities a few months ago led to rather startling savings in time and expense, with better service as a byproduct.

Observations before these changes indicated that a great amount of walking was done between the central maintenance department and the various parts of the plant. It was not difficult to get the picture. An observer placed at strategic points in aisleways stopped and asked each maintenance service man where he came from and where he was going.

It was not uncommon to see two men pushing a small truck with only one or two short pieces of pipe on it. (Incidentally, it was found that only one pipe threading machine was available for several buildings.)

The main plant is split up into twelve buildings, each having from three to seven floors. Therefore it was not difficult to find the reason for the great amount of walking about. Everything was being run from a central point. Since the maintenance workers all punched their cards at this central point, a quarter of an hour elapsed, in some cases, before work was begun.

Formerly, one branch of the Murray Corporation's activities was conducted in a small plant with an entirely separate organization. The maintenance organization in this small plant was efficient, because the workers were never far removed, geographically, from the point of need for their services.

So What to Do?

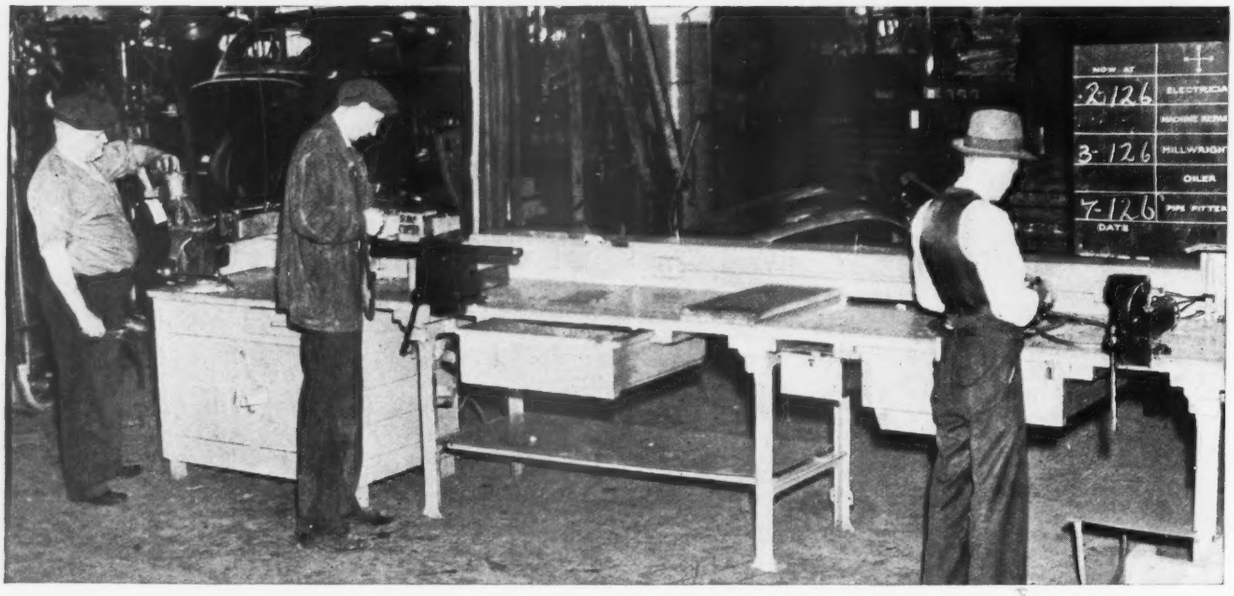
Realization that the organization in the small plant was efficient and that much time was wasted in the larger plant, led naturally to the query: "What can we do to make this large maintenance organization as efficient as the small one?"

The natural answer seemed to be: "Adopt the small-department idea." Now, instead of being centralized, most of the maintenance activities are split up into zones, of which there are fifteen located at strategic points throughout the plant.

The basis used in setting up these zones was a careful consideration of the needs of production and of general factory equipment, such as cranes, located in plant areas in which it seemed advisable to place a zone.

For such activities as cleaning toilets and sweeping floors, time study indicated the man-power requirements. This labor has been divided among the various zones according to needs.

Most activities, however, had to be considered from the standpoint of the types of skilled maintenance labor required to keep processes operating. For example, in the press plant, which contains a maintenance zone, there are machine repair men, oilers, pipe fitters—to take care of air, gas, and water lines—and electricians to look



While waiting for trouble calls the electrician, steamfitter, and welder repairman who are stationed at this maintenance service zone make minor repairs. Note the bulletin board, at the right, which shows where men from this zone are working in the plant

after motors and electrical equipment. In the sewing room, another zone, sewing machine mechanics, electricians, and millwrights are stationed.

In the paint department zone are to be found millwrights, electricians, oilers, chain cleaners, and a spray gun repair man. In a part of the shop where a great deal of spot welding is done, and where many riveters are located, the maintenance force is composed of machine repair men, pipe fitters, and electricians.

Throughout, the type of equipment governs the classes of maintenance workers placed nearby, and the number in each zone is determined by experience. These zones are placed in production departments as close as possible to the foremen's desks, so that they may have prompt service just when and where they need it.

The question will arise at once: "How do you handle such general activities as carpenter work and maintenance of electric trucks, belting, and saws?"

It would not be feasible, of course, to have a blacksmith, a carpenter, or a belt man in each zone, because in many places they would not be needed, and in others only infrequently. Consequently, one of the zones is designated the "shop group."

This group serves the entire plant. All its activities are located in a central spot, or zone. Here are to be found the belt group, blacksmiths, the bandsaw group, the carpenter shop, painters, millwrights, pipe fitters, and electricians.

The electrical repair group is also located centrally and adjacent to the maintenance stockroom, since it would not be economical to have a stock in every zone.

Electric trucks are repaired, and the batteries charged and replaced at a certain point. Elevators are cared for by a man in the general shop group. He is also an inspector for all cables and chains used in handling materials throughout the plant.

Steadier Employment

Cleaning rest rooms and sweeping floors is zoned according to the needs of the various parts of the plant. It may be said here that roof and floor repairs, window washing, and the moving of heavy machinery are handled on contract by outside labor. Handling intermittent activities in this way makes possible more steady employment in the maintenance department than would be the case if the force were adjusted to the maximum demands that are made upon it.

After allowing for these exceptions it still remains true, however, that 80 per cent of the 300 maintenance workers are assigned to, and operate from, the various zones.

No one workman is designated as the zone leader, but it has been found that leadership naturally develops. Of course, supervision is not lacking because we have foremen for each maintenance group. These foremen, whose office is located in the space assigned to the general shop group, go around

✦

Reversing usual practice in which the small plant uses big-plant methods. Here it's a case of the big plant's reproducing small-plant conditions, then tailoring its maintenance service department to fit

✦

to these various zones where their men are placed and give such instructions as may be necessary.

Minor repairs, or repairs within the scope of the zone man-power, are taken care of without recourse to the central office. Frequently, also, one zone will call on another nearby for additional help. If these measures do not result in getting enough electricians, for example, or if a major breakdown occurs, the local maintenance service zone calls the central office.

Usually this will mean sending men from the central shop group, whose work may be delayed, to the point of need. Serious breakdowns have been repaired, however, without notice reaching the plant engineer or his general foreman.

Stores for parts that wear are maintained in the zones. When maintenance workers are not on the floor inspecting equipment and making adjustments, they repair these worn parts and store them in their zones until needed. The sewing room mechanic, for example, keeps several sewing machine heads available for immediate use. These are repaired when he is not on the floor making replacements or adjustments. Repairs to spot welders, air cylinders, in fact practically all wearing parts of special equipment, are handled in the zones. Motors are replaced by zone electricians and sent to the central shop group to be overhauled.

In a large department it may still be possible for a maintenance worker to be somewhere else when the production foreman needs his services. To get around this difficulty a bulletin board is located in each of the zone headquarters, as shown in one of the illustrations. These blackboards measure 3x4 feet and have the name of each class of maintenance labor painted on a separate line. When an emergency arises the board indicates at what spot in the zone each member of the group is working.

This change in organization has reduced the cost of maintenance between 10 and 15 per cent. No longer do we have a large floating population in the aisleways, because zoning has reduced the necessity for walking by placing maintenance men near their work. The dollar total of machine repair expense has also been reduced by a very respectable amount.

Placing maintenance workers in zones has resulted in a reduction in the number of calls from production departments for minor work. However, work orders are handled in the same way as before the change. They come to the plant engineer and go through the central office of the department as formerly. If the maintenance foremen, from their knowledge of the work ahead of their men located in these zones, decide that a particular man can do the job on a work order, he is assigned to it.

While working in a zone, no paper routine for scheduling is involved. Pay of zone workers is, of course, charged to the production department's maintenance account.

First-Class Work the Result

A feeling of pride and responsibility has arisen in the conduct of these zones, and friendly rivalry as well, although the latter was not thought of when the plan was set up. Each group becomes more intimately acquainted with the equipment it is responsible for. Under the old plan, if a machine or piece of equipment was repaired by a millwright, say, he might not get back to that part of the shop for six months. Now the men have to live with the same machines day in and day out. If a repair job is not done properly the first time, the same men have to do it over. Self-protection then results in first-class work.

MAINTENANCE SERVICE SHORTS

Readers are invited to contribute brief illustrated articles reporting out-of-the-ordinary maintenance accomplishments. Accepted articles will be paid for

MECHANICAL POWER DRIVES

Press Punches More at Slower Speed

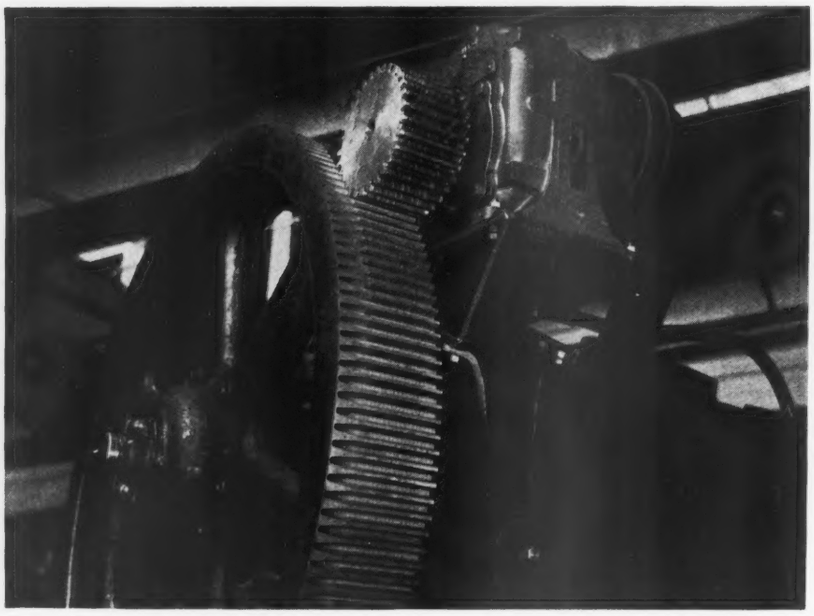
SOURCE
Reliance Electric & Engineering Company, Cleveland

It sounds paradoxical that the number of blanks produced from a power-driven punch press could be increased by slowing down the speed at which the press was operated. That is just what happened on one of our presses.

As originally installed, an 1,800-r.p.m., a.c. induction motor had been belted to the flywheel of the press. The power was caught by a clutch having a maximum catching time of one-half revolution of the flywheel. Since the operator punched as many as 5 to 6 blanks from one strip of material he lost considerable time waiting for the flywheel to catch after he had pressed the foot pedal to engage the clutch. On the other hand, the flywheel speed was too great to allow him to blank all the pieces from each strip at one pressing of the foot pedal.

The circumstances were such as to suggest experimenting with a reduction of flywheel speed sufficient to allow the operator to complete the 5 or 6 punchings without interrupting the operation of the press.

Because the press was overpowered for the work, the power capacity of the flywheel could be reduced by slowing it down, without causing trouble. The driving pulley of the belt drive was already small and could not very well be made smaller. A lower-speed motor was also out of the question because of space limitations. Consequently, the necessary reduction in flywheel speed was accomplished by cutting teeth in the flywheel face and applying power directly to the flywheel through a pinion giving a 5½ to 1 reduction from a geared motor reducer driven by the 1,800-r.p.m. motor.



Teeth cut in flywheel make possible direct drive from geared motor reducer

This arrangement reduced the flywheel speed to the point where the operator could easily blank 5 or 6 pieces at one pressing of the foot pedal. In addition, the direct-geared drive had the further advantage that, unlike the belt drive that it replaced, no slipping could occur between the motor and flywheel when starting.

The drive is quick and functions smoothly. Much clutch wear has been eliminated, and the job made less tiring for the operator.

Making electricians responsible for all adjustments in belt tension eliminated burned out motor bearings in one plant. Machine operators were making belts too tight.

Welding Saves Replacing Old Pulley

K. B. HUMPHREY, *Sayreville, N. J.*

Machinery in a plant formerly had been driven from one lineshaft. A clutch was used on each shaft pulley. Later, when the lineshaft was broken into sections, each driven by an electric motor, the clutch pulleys were left in place but the operating lever was removed, so the effect was that of a solid pulley keyed to the shaft by the fast member of the clutch. In time, however, the babbitted bushing of one unit became hot and the fast member cracked.

The pulley was of the correct outside diameter and face, about 52 in. by 12 in. The shaft was 6 7/16 in. in diameter. In order to use the pulley it was necessary to make a cast-iron bushing to replace the old babbitted bushing. A casting was turned down and bored to fit the shaft and the inside of the hub on the pulley, which was of the split cast-iron type with the

clutch ring cast to the spokes. A keyway was cut in the bushing and the bushing split to correspond with the pulley. A corresponding keyway was cut in the large driveshaft. This keyway had to be cut by hand.

After the keyway was cut the pulley and bushing were assembled on the shaft and the bolts in the hub tightened. In this way the bushing was keyed securely to the shaft, but in order to make a good job the bushing was electrically welded to the hub of the pulley. Practically, the result was a pulley with the correct bore and a key to prevent its turning on the shaft. There was a considerable saving over the cost of a new pulley.

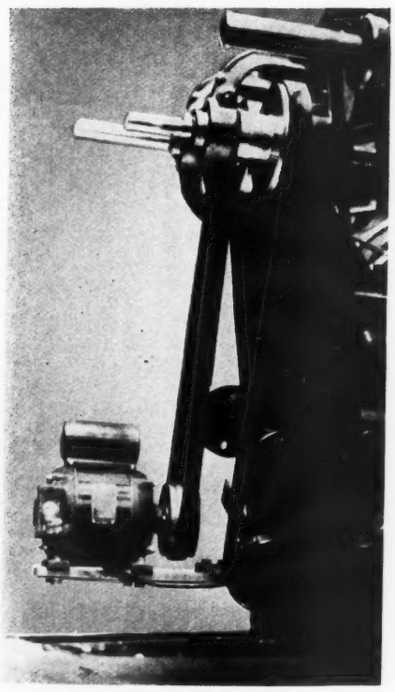
•

New Drive Increases Output of Old Drillpresses

P. F. Atwood, *Terryville, Conn.*

There are still in use many old multiple-spindle drillpresses driven by a common horizontal shaft at the rear by belts running over quarter-turn pulleys of the caster type to the spindle.

Use of high-speed drills has made



these machines more or less inadequate for modern duty, because the range of speeds is limited. Slow speeds are needed on tapping and counterboring operations; therefore, the drilling speeds, although higher, are not sufficiently high to get the maximum output from the drills.

Study of this problem in one plant disclosed two possible solutions:

1. Increasing the spindle speed by increasing the diameter of the pulley on the horizontal drive shaft. However, it would be necessary to dismantle the press if another spindle were to be operated at the low speed, making impossible quick changes in set-ups.

2. Driving the spindle independently by some arrangement which could easily be changed as the set-up demanded. This method was adopted.

A fractional-horsepower motor was mounted on a plate having a shank which could be inserted in the caster mounting hole. With this arrangement it is easy to change the speed. The motor is operated vertically and the drive is by flat belt, which can be tightened to suit by the regular handwheel through the caster mounting.

The photograph shows two spindles of a drillpress, of which the one in the foreground is belted in the original manner, while the rear one has had the belt caster removed and the motor put in place.

Since the motor can pivot freely the reaction torque maintains the belt tension. This feature has reduced the tension considerably, and the pulley bearings at the top of the spindle now run considerably cooler at the higher speeds than they formerly did with manual adjustment of belt tension. The ½-hp. motor easily maintains a spindle speed of 3,200 r.p.m., when driving a No. 25 drill in cast iron, whereas the former speed was 2,300 revolutions per minute.

VENTILATING AND AIR CONDITIONING

Rotator Keeps Exhaust Steam out of Ventilators

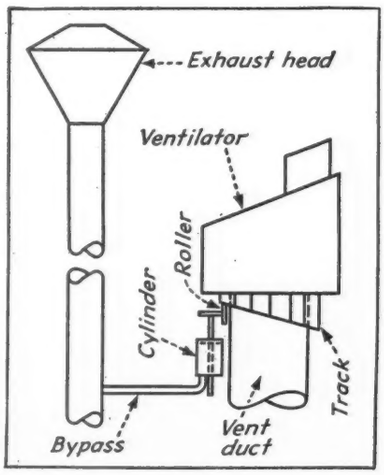
M. T. Pate, *Longview, Tex.*

Spoilage in the packing department of a plant putting out a line of individually packed lubricants proved that the damage was due to the intermittent presence of water in the packing room, enough being present to spot labels and swell cartons.

Further investigation traced this water to condensation from a cone-type exhaust steam vent, mounted on the roof not far from the revolving-type ventilator serving the packing department. If there was no wind, and the ventilator cowl chanced to point toward the exhaust head, the cowl would catch the condensation. As it was not feasible to change the location of either vent or exhaust head without incurring considerable expense and relocation of units, it was decided to fit the ventilator with an automatic device that would turn the open end of the cowl away from the exhaust head when the latter was in operation.

A bypass was run from the exhaust line to a vertical cylinder in which was mounted a piston with rod extending through stuffing boxes at top and bottom heads. On top of this rod a horizontal member was mounted, to which a roller was attached. An inclined rail or track was fixed to the base of the rotating portion of the ventilator, with its highest point at the heel of the hood.

Under normal operating conditions, when no steam is being exhausted, the piston is at the bottom of the cylinder, and the roller does not contact the track. That leaves the cowl free to rotate under wind pressure on the directional vane.



But when steam is being exhausted, back pressure created by resistance of the passages in the exhaust head forces steam through the bypass into the cylinder. This raises the piston, forces the roller against the track. The angle at which the track is set, and the upward force the roller exerts on it, causes the mouth of the ventilator to turn away from the exhaust head, so that steam does not enter the ventilator.

Since pressure of the exhaust steam is slight, a sufficiently strong wind will revolve the cowl against the steam pressure. But if that happens, the wind is strong enough to carry away the droplets of condensation before they enter the ventilator. Also, if wind is strong enough to carry rain within the cowl, it is sufficiently strong to overcome the

force that is exerted on the cowl by the rotator, and to turn the ventilator so as to secure ejector action.

So successful was the experimental installation in the worst spot that it was later copied by neighboring factories, one being especially satisfactory in directing ventilator action in a rubber plant with intermittent, but vigorous, spent process steam exhaust.

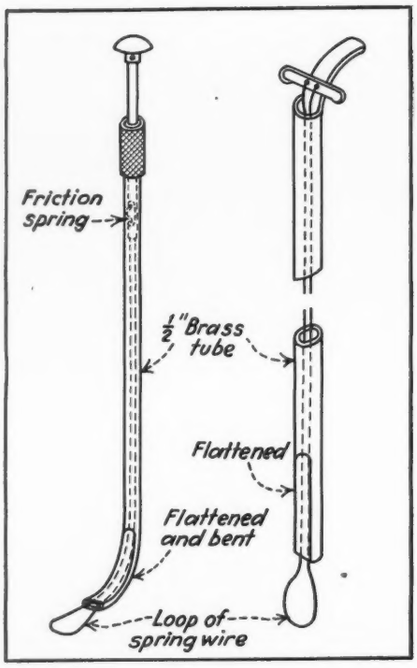
•

Winter Comfort in Summer

Extremely high temperatures in the summertime around bottle-blowing machines and in other departments at the Fairmont Glass Company, Indianapolis, Ind., seriously reduced the efficiency of workers. Production was low, breakage high.

These conditions were remedied by the installation of a central system for distributing cool, dehumidified air to all working places where temperatures became high enough to cause discomfort or reduce efficiency. It comprises cooling coils supplied with water at 54 deg. F. and a 43,000 c.f.m. fan that forces the cooled air through a system of ducts.

The winter rate of production now holds up through the hot months, breakage has been reduced to the minimum, and working conditions are much more comfortable.

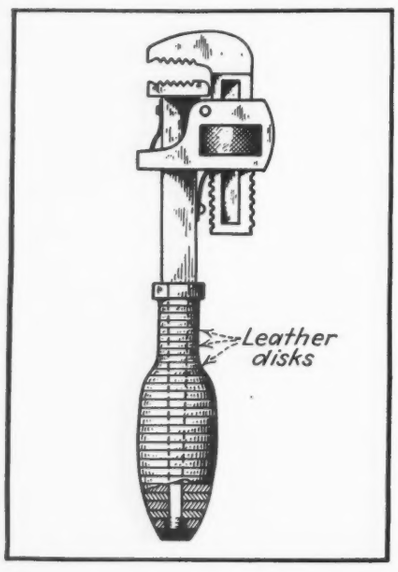


BUILDINGS AND SERVICES

Leather Handle for Pipe Wrenches

S. H. COLEMAN, *Roanoke, Va.*

Here is a kink for the mechanic who is partial to the wooden grip so often found on pipe wrenches some time ago. One great trouble with these grips was their inability to withstand rough usage



without becoming split or so scarred that they were unsafe. This trouble can be done away with, and all the advantages of the hand-fitting grip retained, by removing the wooden handle and substituting one built up of pieces of leather cut from old belting or other sources.

The leather sections are cut in circular form with slightly greater diameter than that of the finished grip, and punched with elliptical holes having an area corresponding to the cross-sectional area of the metal handle extensions. Leathers are then shellacked, slipped over the metal one by one, pulled up tight on a vise. The handle nut is then screwed on and the whole assembly finished to the proper contour with a shoemaker's rasp.

This same scheme can be used on pipe wrenches having straight steel handles if a metal washer is slipped over the handle and spot welded in place so that it forms a retainer for the lower end of the grip, and the end of the handle is cut down and threaded to take a holding nut.

•

It Picks Up Parts Dropped in Machines

CHAS H. WILLEY, *Penacook, N. H.*

For those who work about machinery all the time there is always that aggravating occurrence of dropping a small part into the vitals of the machine, where it requires a lot of perspiration and patience to recover it, if not the dismantling of the machine.

I have made a couple of long-reach pick-ups from ½-in. brass tubing and steel spring wire or piano wire. The sketches show two styles, both employing a loop of steel wire to catch on to the dropped part. The scheme is the same in principle as the choke wire of your car—a steel wire in a tube acts like a flexible shaft. As you push down on the loop it leaves the end of the tube and opens out; after you have placed the loop over the object to be retrieved, you pull the wire back into the tube clinching the object, and holding it until you recover it.

On one occasion this very simple little gadget saved us a good deal of time and money and the idleness of several operators, when a wrench dropped into an assembly machine which would have had to be dismantled had we not had this pick-up tool.

•

Eliminating Dust When Drilling Concrete

JOHN LINDUS, *Newark, N. J.*

Shown in the sketch is a very satisfactory method of collecting rock-drilling dust. If an ordinary paper box, through which a hole has been punched for the drill, is placed over the hole being drilled, it will confine the dust, which can be drawn off through a hose into a vacuum cleaner.

DATA SHEET No. 1

Horsepower Ratings for Oak-Tanned Leather Belting

Approved by the Engineering Committee of the American Leather Belting Association and officially adopted by the Association December 7, 1938

HOW TO USE

To Find Width of Belt Required: Divide horsepower rating of prime mover or nominal load by values in Tables I, II, and III. See Example 1

To Find Rating of a Belt: Multiply belt width by values in Tables I, II, and III. See Example 2

Table I. Horsepower per Inch of Width

Belt Speed Ft. Per Min.	Single Ply		Double Ply			Triple Ply	
	* 11/64" Med.	* 13/64" Heavy	* 18/64" Light	* 20/64" Med.	* 23/64" Heavy	* 30/64" Med.	* 34/64" Heavy
600	1.1	1.2	1.5	1.8	2.2	2.5	2.8
800	1.4	1.7	2.0	2.4	2.9	3.3	3.6
1000	1.8	2.1	2.6	3.1	3.6	4.1	4.5
1200	2.1	2.5	3.1	3.7	4.3	4.9	5.4
1400	2.5	2.9	3.5	4.3	4.9	5.7	6.3
1600	2.8	3.3	4.0	4.9	5.6	6.5	7.1
1800	3.2	3.7	4.5	5.4	6.2	7.3	8.0
2000	3.5	4.1	4.9	6.0	6.9	8.1	8.9
2200	3.9	4.5	5.4	6.6	7.6	8.8	9.7
2400	4.2	4.9	5.9	7.1	8.2	9.5	10.4
2600	4.5	5.3	6.3	7.7	8.9	10.3	11.0
2800	4.9	5.6	6.8	8.2	9.5	11.0	12.1
3000	5.2	5.9	7.2	8.7	10.0	11.6	12.8
3200	5.4	6.3	7.6	9.2	10.6	12.3	13.5
Minimum Pulley Diameters — Belts Under 8" Wide	3"	5"	6"	8"	12"	20"	24"
Minimum Pulley Diameters — Belts 8" Wide and Over	5"	7"	8"	10"	14"	24"	30"
	These are the minimum allowable pulleys for belts of the above thicknesses						

Belt Speed Ft. Per Min.	Single Ply		Double Ply			Triple Ply	
	* 11/64" Med.	* 13/64" Heavy	* 18/64" Light	* 20/64" Med.	* 23/64" Heavy	* 30/64" Med.	* 34/64" Heavy
3400	5.7	6.6	7.9	9.7	11.2	12.9	14.2
3600	5.9	6.9	8.3	10.1	11.7	13.4	14.8
3800	6.2	7.1	8.7	10.5	12.2	14.0	15.4
4000	6.4	7.4	9.0	10.9	12.6	14.5	16.0
4200	6.7	7.7	9.3	11.3	13.0	15.0	16.5
4400	6.9	7.9	9.6	11.7	13.4	15.4	16.9
4600	7.1	8.1	9.8	12.0	13.8	15.8	17.4
4800	7.2	8.3	10.1	12.3	14.1	16.2	17.8
5000	7.4	8.4	10.3	12.5	14.3	16.5	18.2
5200	7.5	8.6	10.5	12.8	14.6	16.8	18.5
5400	7.6	8.7	10.6	12.9	14.8	17.1	18.8
5600	7.7	8.8	10.8	13.1	15.0	17.3	19.0
5800	7.7	8.9	10.9	13.2	15.1	17.5	19.2
6000	7.8	8.9	10.9	13.2	15.2	17.6	19.3
Minimum Pulley Diameters — Belts Under 8" Wide	3"	5"	6"	8"	12"	20"	24"
Minimum Pulley Diameters — Belts 8" Wide and Over	5"	7"	8"	10"	14"	24"	30"
	These are the minimum allowable pulleys for belts of the above thicknesses						

* See Table IV.

Table II. Correction Factor for Center Distance and Small-Pulley Diameter

Diameter of Small Pulley in Inches	Center Distance in Feet															
	Up to 4'		6'		8'		10'		12'		15'		20'		25' & Over	
	Tight Side		Tight Side		Tight Side		Tight Side		Tight Side		Tight Side		Tight Side		Tight Side	
	Above	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above	Below
3"	.45	.45	.46	.47	.47	.48	.47	.49	.48	.50	.49	.52	.48	.54	.48	.55
4"	.53	.53	.54	.55	.55	.57	.56	.59	.57	.61	.58	.63	.59	.65	.59	.66
5"	.59	.59	.60	.62	.62	.64	.63	.66	.63	.68	.65	.70	.66	.72	.66	.74
6"	.62	.62	.63	.65	.65	.68	.66	.70	.67	.72	.68	.74	.69	.76	.70	.78
8"	.66	.66	.67	.69	.69	.72	.70	.74	.71	.76	.72	.78	.73	.80	.74	.82
10"	.68	.68	.70	.71	.71	.74	.73	.77	.73	.79	.75	.81	.76	.83	.77	.85
12"	.70	.70	.72	.74	.73	.77	.75	.79	.76	.81	.77	.83	.78	.86	.79	.88
15"	.73	.73	.74	.76	.76	.79	.77	.82	.78	.84	.80	.86	.81	.89	.82	.91
18"	.75	.75	.76	.78	.78	.81	.79	.84	.80	.86	.82	.89	.83	.91	.84	.93
24"	.77	.77	.79	.81	.81	.84	.82	.87	.83	.89	.85	.92	.86	.94	.87	.96
30"	.79	.79	.81	.82	.82	.86	.84	.89	.85	.91	.87	.94	.88	.96	.89	.98
36"	.80	.80	.82	.84	.83	.87	.85	.90	.86	.92	.88	.95	.89	.98	.90	1.00

Consider gravity idler and pivoted motor drives with tight side of the belt next to the pivot point as having 25-ft. centers. For pivoted base drives where tight side of the belt is away from the pivot point, these tables do not apply

DATA SHEET No. 2

Horsepower Ratings for Oak-Tanned Leather Belting

Table III. Service Correction Factors

Atmospheric Condition	Clean, scheduled maintenance	1.2
	Normal	1.0
	Oily, wet or dusty	0.7
Angle of Center Line	Horizontal to 60 degrees from horizontal	1.0
	60 to 75 degrees from horizontal	0.9
	75 to 90 degrees from horizontal	0.8
Pulley Material	Fiber on motor and small pulleys	1.2
	Cast iron or steel	1.0
Service	Temporary or intermittent	1.2
	Normal	1.0
	Important or continuous	0.8
Peak Loads	Light, steady loads such as steam engines, steam turbines, diesel engines, and multi-cylinder gasoline engines	1.0
	Jerky loads, reciprocating machines such as normal-starting-torque squirrel-cage motors, shunt-wound d.c. motors, and single-cylinder gasoline engines	0.8
	Shock and reversing loads, full-voltage start such as wound-rotor (slip ring) motors, synchronous motors	0.6

Table IV. Thickness Specifications (in Inches) for Flat Leather Belting

	Light	*Medium*	*Heavy*
Single Ply		11/64	13/64
Double Ply	18/64	20/64	23/64
*Triple Ply		30/64	34/64

All thicknesses in this table are *average* thickness in *inches,* and should be determined by measuring 20 coils and dividing this total by the number of coils measured. In rolls of belting containing less than 20 coils, the average thickness should be determined by measuring all the coils in the roll. Allowable tolerances for all thicknesses plus or minus 1/64 inch from above averages.

Uniformity: No point in single belting shall be more than 3/64 inch thicker or more than 2/64 inch thinner than the average thickness. With doubles, the tolerances shall be 2/64 inch thicker or thinner than the average.

* These are averages for general usage. Most triple-ply belts are usually constructed for particular drive conditions. Tolerances for single- and double-ply belts do not apply.

EXAMPLE 1

PROBLEM: Select belt for following drive—

Motor—10 hp., 1750 r.p.m., line start, induction
Pulley 6-in. diameter x 6¾-in. face, fiber

Compressor—Started automatically against pressure
Pulley 30-in. diameter x 6½-in. face

Conditions—Tight side of belt below, pulleys 6 feet center to center, center line approximately horizontal, important refrigeration service, normal atmospheric conditions

SELECTION OF FACTORS:

Belt Speed $\frac{6 \times 3.14 \times 1{,}750}{12} = 2{,}750$ feet per minute

From Table I: Light double belt suited for 6-in. diameter pulley will transmit 6.7 horsepower per inch of width at 2,750 feet per minute

From Table II: Factor for center distance and small pulley diameter = 0.65

From Table III:

Atmospheric condition	1.0
Angle of center line	1.0
Pulley material	1.2
Service	0.8
Peak load	0.6

CALCULATION: $\frac{10}{6.7 \times 0.65 \times 1.0 \times 1.0 \times 1.2 \times 0.8 \times 0.6} = 3.99$ in.

Therefore, use 4-in. light, double belt

EXAMPLE 2

PROBLEM: Determine capacity of 8-in. heavy, double belt on following drive—

Lineshaft—200 r.p.m., 48-in. diameter x 12-in. face cast iron pulley

Fan—600 r.p.m., 16-in. diameter x 12-in. face cast iron pulley, requiring 35 hp. at this speed

Conditions—Tight side above, 16-ft. centers, drive nearly vertical, 8 hours per day operation, exhausting from woodworking shop, dusty conditions

SELECTION OF FACTORS:

Belt Speed $\frac{48 \times 3.14 \times 200}{12} = 2{,}500$ feet per minute

From Table I: Heavy, double belt is suited for 16-in. diameter pulley, and will transmit 8.55 horsepower per inch of width at 2,500 feet per minute

From Table II: Factor for center distance and small pulley diameter = 0.80

From Table III:

Atmospheric condition	0.7
Angle of center line	0.8
Pulley material	1.0
Service	1.0
Peak load	1.0

CALCULATION: 8 x 8.55 x 0.80 x 0.7 x 0.8 x 1.0 x 1.0 x 1.0 = 30.6 horsepower

Therefore, belt not suited for 35-hp. load

NOTE: This belt can be used if any one of the following changes is made:

1. Use fiber pulley on fan
2. Reduce angle of drive to 60 degrees from horizontal
3. Protect drive from dust
4. Increase pulley diameters to 60 inches and 20 inches

If it is not practical to change the drive, use a 10-in. heavy double belt

Exide-Ironclads... PLUS Exide Efficiency Equipment

Exide's newest development, a 24-cell, 21-plate Exide-Ironclad Battery of the MEH type. More than 45 kilowatt hours available in a single unit! Designed to operate modern heavy duty trucks at full speed throughout an entire shift without battery change.

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Exide Charge Control Unit. Automatically controls charging rate and signals when battery is charged.

Exide Discharge Indicator. Signals when a freshly charged battery is needed.

. . . insure maximum production with minimum costs in material-handling

EXIDE keeps pace with—and anticipates—industry's ever-broadening needs. As greater production-demands brought better, bigger industrial trucks, capable of handling ten to fifteen-ton loads . . . Exide developed new, tremendously powerful Exide-Ironclads to operate them efficiently and economically. To the MVM and TLM Exide-Ironclads were added the oversize Types FLM and MEH, compact units of amazing power, with capacities of 700, 800, 900 and 1000 ampere-hours at the normal discharge rate.

But even good batteries require proper care. So Exide developed the Exide automatic Discharge Indicator, which gives visual warning when an Exide-Ironclad is approaching discharge. This contributes to better truck performance, and eliminates the possibility of schedule-destroying "tow-ins."

For still better service to Exide-Ironclad users, Exide developed the Exide Charge Control Unit, which *automatically* controls the charging rate of batteries, automatically cuts the circuit and signals when the charge is complete.

Exide also developed the Exide Odometer and Exide Test Kit, with which it is possible to determine what type and size of battery is needed to obtain the utmost efficiency from any electric industrial truck.

Let the Exide System solve your material-handling problems. Rugged, long-lasting Exide-Ironclads and these new auxiliary aids will enable you to move more material, move it faster, more efficiently, more economically. Write for full details.

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THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

You Want to Know

more about the items mentioned on this page.
Letters to the addresses given will bring information

• METAL AND PLASTIC SHAPES are made to specifications without dies by a new process. Economical production of small quantities or single shapes is the result, which should be a boon to engineering departments in their design activities. Precision Shapes, Inc., 230 Park Ave., New York.

• PUTTY APPLICATOR has only to be drawn slowly along edges of the window sash to make smooth putty surface at a definite angle. With it unskilled persons can do a good job without smearing putty on the glass. Simplex Putty Applicator Co., 4835 Woodward Ave., Detroit.

• "SAFETY CODE for Compressed Air Machinery and Equipment" presents set of rules which, if observed, will insure reasonable safety for persons and property where compressed air is being used for cleaning, drilling, hoisting, or chipping. The American Society of Mechanical Engineers, 29 West 39th St., New York.

• INDUSTRIAL RELATIONS program of the New York City WPA administration is set forth in a booklet that should be valuable to private industry, because the peculiar circumstances of WPA in New York have necessitated a broad, complete program. U. S. Works Progress Administration, 70 Columbus Ave., New York.

• QUICK GUIDE to books, periodicals, maps, and miscellaneous publications containing information for business men, anticipates the type of information you'll be seeking when you go to a library, and lists sources where you'll find it. "Business Information and Its Sources" can be obtained for $1 per copy from Newark Business Branch Library, 34 Commerce St., Newark, N. J.

INSPECTORS have a new tool in the "Magnilite," a combination lamp and magnifier that concentrates daylight rays on parts while they are given the onceover through a mounted magnifying glass. Greater accuracy, less eyestrain are its big advantages. A universal joint in the base makes possible swinging the instrument to any position, or it can be detached, used Sherlock Holmes fashion. Mizzy, Inc., 105 E. 16th St., New York

• CASTABLE REFRACTORY, mixed with water and cast into any required refractory shape, is ready for service in 24 hours. Light in weight, it is suitable for temperatures up to 2,200 deg. Fahrenheit. Johns-Manville, 22 East 40th St., New York.

• PAINT USERS will be interested in a suggested formula for comparing paints. The formula introduces a new unit, the a.f.c. (average foot cost) which, its sponsors hope, will take its place along with B.t.u., r.p.m., etc. American Asphalt Paint Co., 43 East Ohio St., Chicago.

• SINGLE-COAT PRIMER for bonding liquid rubber coatings to metals, concrete, glass, and brick, dries cold within an hour, withstands temperatures up to 212 deg. Fahrenheit. Used alone, it rustproofs and waterproofs. Self-Vulcanizing Rubber Co., 605 Washington Blvd., Chicago.

• PROTECTION of employees' health against air impurities is discussed in a bulletin, "Routine Sampling for Control of Atmospheric Impurities," that lists methods of collection, determination, and apparatus for checking 45 dangerous substances commonly found in industrial atmospheres. Air Hygiene Foundation, 4400 Fifth Ave., New York.

• OPERATING and financial ratios for 72 lines of business activity are intended as guides to management in gaging how efficiently a particular business is operating, in comparison with its industry and business in general. "They Said It With Inventories" is title of the booklet in which they're published. Dun & Bradstreet, Inc., 290 Broadway, New York.

• CHRONOGRAPH for time-study work combines wrist watch, time-out watch, stop watch, tachometer, telemeter, 30-min. register, 60-sec. timer, and 12-hr. register in one instrument. Can be used to calculate speed of production from 1/5th sec. per unit to 30 min. per unit. Jardur Import Co., 21 West 19th St., New York.

• CONCRETE FLOORS, old or newly laid, can be colored in any of 12 colors. If floors are clean and dry before "Glazecoat" finish is applied, the opaque, nonslip finish will hold in subsequent dampness. The Master Builders Co., 7016 Euclid Ave., Cleveland.

• HANDS get a shower bath in the "Showerway," a unit not much larger than a drinking fountain, that provides ultrasanitary hand washing by showering warm water and soap on user's hands as he places his foot on a pedal. Lyon Metal Products Co., Aurora, Ill.

• FANS come to mind with summer coming on. There's one fan that circulates air noiselessly, and in such a way that papers on the desk won't even ripple. Built into floor and ceiling lamps and smoking stands, you only know its presence by the comfort it brings. Kisco Corp., 39th & Chouteau Sts., St. Louis.

How to do it?

For savings in plant management, be sure to check these G-E developments

LONG-LASTING PROCESS TIMERS

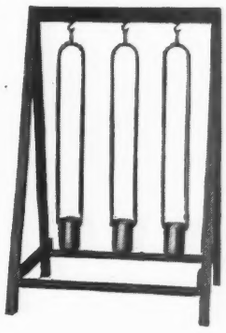
This G-E vacuum-tube timer has only one moving part—a small control relay—and that makes it just about perfect for long wear. If it's maintained accuracy you want—or reliable processing, cycling, sequencing, limiting, or delaying—find out more about this unit. Use the coupon to ask for Bulletin GEA-2902A.

ADJUSTABLE-SPEED A-C MOTORS

If your power is alternating-current and you need an adjustable-speed motor that maintains essentially constant speed with changes in load, you'll find that the Type BTA polyphase motor has almost all the desirable characteristics of direct-current shunt motors. High efficiency and high power-factor, full-voltage starting, and high starting torque per ampere are just a few of its many features. Publication GEA-712E contains further information.

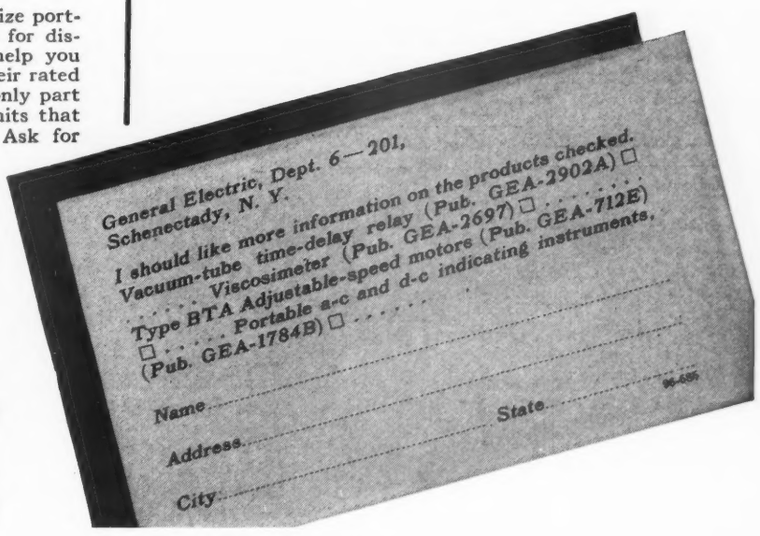
FOR ACCURATE SURVEYS— A-C AND D-C PORTABLES

Factory men tell us that miniature- and medium-size portables (a-c and d-c) are helpful, inexpensive tools for discovering ways to make plant savings. They'll help you detect power leaks, keep your lamps burning at their rated voltage, indicate overloaded motors. And they're only part of the complete G-E instrument line—a line of units that are hard to beat for accuracy and reliability. Ask for Bulletin GEA-1784, which gives details.



TO MEASURE VISCOSITY

Here's a G-E viscosimeter that's easy to operate and that provides accurate measurements in about 30 seconds—a real time saver. Orifice sizes are available for heavy, medium, and light viscosities, and, furthermore, the price is right—only $8.50 each, net, f.o.b. Schenectady. For further details ask for Publication GEA-2697.

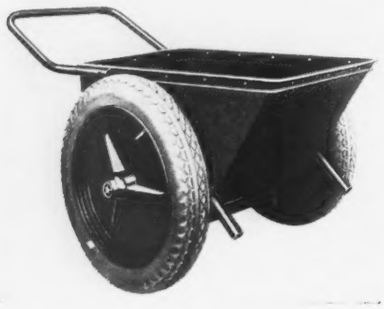


GENERAL ELECTRIC

What's New in Equipment

Cart

Features of Model B pneumatic-tired cart are: heavy pipe axle; sealed wheel hubs; eyebolt for tow hook; front legs



for dumping; smooth, lap-welded, water tight hopper; standard tires and disk wheels. Made in two capacities: 6 cu. ft. and 9 cu. ft. Red Star Products, Inc., 12910 Taft Ave., Cleveland.

Blow Gun

Blow gun speeds up dusting operations and, because of its long nozzle, can be used in places difficult to reach. Lever trigger allows operator to grasp gun in any manner and still have control of air volume by natural squeeze of hand. The gun is made of brass and finished in chrome plate, has a replaceable air washer, a ¼-in. female pipe thread hose connection, and a ⅛-, or 5/64-in. nozzle orifice. Decora Mfg. Co., Inc., Berkeley, Calif.

Pumps

Turbine-driven centrifugal "Monobloc" pumps, for installation where steam power is available, are for application where there is fire and explosion risk from chemicals, gasoline, dust, oil or gas. They are especially suited to air-conditioning, refrigeration, and heating-system installations. Capacities range 10-400 gal. per min. at 10-240 ft. total dynamic head with steam pressures ranging to 300 lb. per sq. in. maximum. Fittings may be had in standard bronze, iron, or special materials. Worthington Pump and Machinery Corp., Harrison, N. J.

Wrench

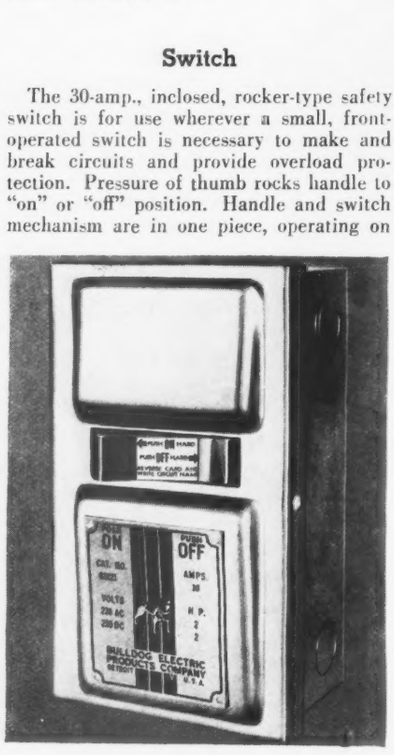
No. 56 torque-indicating wrench is constructed with a small head so as to be usable not only in obtaining uniform tension on bolts in turbines, pipe flanges, couplings, pumps, but also in those places that are hard to get at. Its shaft is of heavy, ground, spring steel with a pointer that remains rigid. The scale is calibrated from 0 to 200 ft.-lb. Located on the shaft near the handle grip, it moves under the pointer as pull is exerted on the shaft. The wrench is permanently adjusted, equipped with ½-in. square adaptor, has no moving parts, weighs 3 lb., and has an overall length of 23 in. Bonney Forge & Tool Works, Allentown, Pa.

Pyrometer Controller

"Celectray" Model V indicating pyrometer controller is said to be vibration-proof. Position of a light beam reflected from mirror of a moving galvanometer is detected photoelectrically. Action of vibration upon the galvanometer cannot be transmitted through the instrument to the control device. Damped photoelectric circuit does not respond to abnormal disturbance of the light beam. A safety shut-off feature is incorporated. C. J. Tagliabue Mfg. Co., Park and Nostrand Aves., Brooklyn, N. Y.

Switch

The 30-amp., inclosed, rocker-type safety switch is for use wherever a small, front-operated switch is necessary to make and break circuits and provide overload protection. Pressure of thumb rocks handle to "on" or "off" position. Handle and switch mechanism are in one piece, operating on



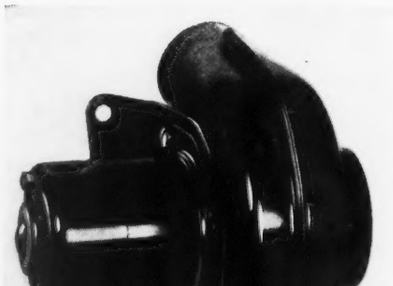
frictionless knife-edge bearings. Other features are positive action full-floating contacts, screw-type wiring terminals, ten knockouts, silver-surfaced current-carrying parts. Circuit name or number can be written on reverse side of card in handle. Bull Dog Electric Products Co., 7610 Jos. Campau Ave., Detroit.

Cut-Off Saw

Portable slide swing saw is a single unit that may be operated from any light socket. It uses no overhead rigging, may be moved about and mounted on any level surface large enough to hold it. Wide materials such as wallboard, plywood, composite materials and light metals may be cut to any angle from 90-45 deg. By replacing the saw with a grinding wheel it can be used for sharpening tools. May also be combined with a sanding disk. Requiring an 8-in. saw blade and a ¼-hp. motor, it will cut materials up to 2x15 in. Louis Zaler Mfg. Co., Dunellen, N. J.

Blowers

Motor-driven blowers for cooling, heating, and air-changing are built in either single- or double-outlet types with multi-blade fans. Twin blowers are made in 115- and 230-volt a.c. models with free air dis-



charge of 120 cu.ft. per min. Single blowers are produced in 60-cycle, 115- and 230-volt models, a.c., with either right- or left-hand delivery; 25-cycle, 115- and 230-volt models, d.c. and a.c.-d.c. with right hand delivery; 6-, 12- and 32-volt models with right-hand delivery. Single blowers have an air discharge of 60 cu.ft. per min. Delco Appliance Division, General Motors Sales Corp., Rochester, N. Y.

Welding Timers

Line of electric welding timers for use with gun, spot, projection, and automatic equipment comprises models ranging in application from single spot to multiple automatic spot welding up to 600 spot welds per min. Use of standard relays and electronic tubes in construction of controls enables selection of any combination of controls for a particular application. The controlled interrupted time model permits the welding of heavy sections up to ½ in. thick. Cycles of welding current may be

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Three BIG Reasons Hundreds of Plants are Switching to Allis-Chalmers Extra-Value SSUnit Pumps!

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MORE GALLONS! You get more gallons with SSUnit Pumps because you get more efficient operation. Actual results in the field prove that new SSUnit Pumps in many cases give more than a 15% greater supply of water than older types of pumps . . . and that more water means more power dollars saved!

But you don't stop there! For coupled to the SSUnit pump is the famous Allis-Chalmers Lo-Maintenance Motor . . . the motor that has proven performance records of beating conditions that many times wreck ordinary motors in a few weeks. There's no "buck-passing" . . . Allis-Chalmers accepts full responsibility for both motor and pump!

PUMPING BRINE IN REFRIGerating system of a large county institution, this SSUnit Pump takes less space, costs less, gives more gallons!

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set, thus making possible spot welding of hard-to-weld metals such as stainless and low-tensile steels. For automatic spot welding and multiple welding operations the timer will automatically open and close the electrode at periodic intervals determined by setting of time relay units on panel of timer. Available for 110, 220, 440, 550 volts; 25, 50, and 60 cycles; push-button control voltages of 6, 110, 220. May be used with various types of tubes and mechanical contactors. Weltronic Corp., Detroit.

Hammer

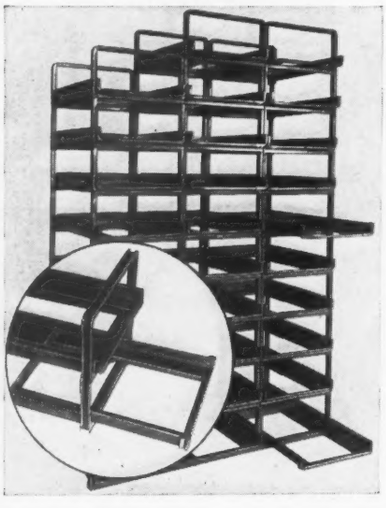
No. 34 portable electric hammer has been redesigned to increase power and speed up drilling. It is a self-contained unit powered by a universal motor, and is complete without transformer or rectifier. Action, characterized by a follow-through stroke, is developed by an oscillating weight and spring assembly, the weight being driven indirectly by a crank. The motor is mounted at right angles to the barrel and operates through a train of reducing gears. Tool weighs 17 lb., develops 2,300 blows per min., and has a capacity in concrete or brick of 1⅛ in. For use in drilling, channeling, and vibrating concrete, for removing form marks from concrete surfaces, for calking joints and seams, removing scale in boilers, gouging and shaping wood beams, and like operations. The Black & Decker Mfg. Co., Towson, Md.

Spray Hose

"Indestructible High Pressure" spray hose, for pressures up to 800 lb., is made of a tube designed to resist deteriorating action of spray solutions; is composed of three braided plies of super-strength yarn developed for high pressure work; has a cover of black abrasive resisting stock. Available in ⅜-, 7/16-, and ½-in. inside diameter sizes. New York Belting & Packing Co., One Market St., Passaic, N. J.

Box Storage

"Stackracks," interlocking units of channel and formed steel, can be set up to form box storage racks of any height, size, or



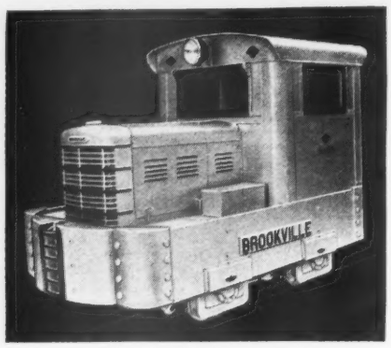
capacity. Roller bearings in the channel steel of the slide provide for an easy gliding movement of the slide and restrict its outward motion to one-half the length of the box. Designed particularly for plants where heavy parts must be stored in boxes. Stackbin Corp., 50 Troy St., Providence, R. I.

Frequency Meter

Type FA 4-in. square a.c. frequency meters have an electro-magnet mechanism. Available for flush mounting in Bakelite, for surface mounting in metal in four models operating on 100-125, 125-150, 200-225, 225-250 volts; 55-65 cycles. Has scale length of 3 5/16 in. Dials are illuminated by two 6-volt bulbs, one at each end of dial. Bulbs can be connected to an independent 6-volt source. Weighs 9 lb. with reactor. Roller-Smith Co., Bethlehem, Pa.

Locomotives

Locomotives powered by Ford 85- and 95-hp. engines range from 2½-8 tons in size, in any gage. Equipped with an all-speed reverse, which makes all forward speeds available in either direction. To insure higher speed over poor track, the



locomotives are built with dual-spring journal suspension. Gasoline engines can be replaced with diesels. Brookville Locomotive Co., Brookville, Pa.

Panelboards

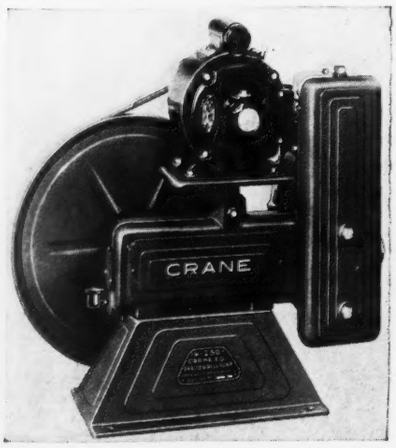
Rocker-type panelboards for control of lighting and small power circuits have rocker "on" and "off" switches, a panel unit of porcelain for maximum dielectric strength and resistance to heat. Circuit names or numbers may be written on cards and inserted in switch handles. Other features are exposed screw-type wiring terminals and silver-surfaced current-carrying parts. Available in circuits from 4-40 in multiples of 4. Bull Dog Electric Products Co., 7610 Jos. Campau Ave., Detroit.

Time Recorder

"Time Totalizer" automatically measures "on time" of a.c. circuits. It is inclosed in a dustproof case with provision for mounting and wiring. Number wheels, geared to a synchronous motor, record time in hours and tenths of hours. May be connected in parallel with a motor, lighting circuit, and the like, to accumulate total "on time." It registers working time in operation of printing presses, textile machinery, machine tools, and other equipment, thus affording data for figuring costs and planning production, as well as helping determine when maintenance is necessary. Production Instrument Co., 700-706 West Jackson Blvd., Chicago.

Pumps

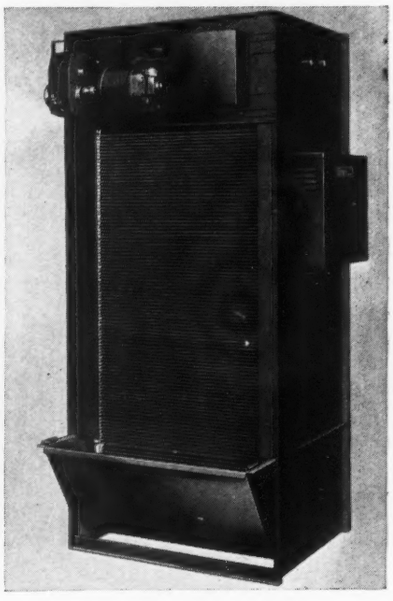
"Crane K Series" shallow well pumps are built in sizes capable of pumping 250 and 375 gal. per hr., and are designed for 40 lb. maximum pressure with 22-ft. suction lift having a 1-in. suction and ¾-in. discharge. Available in horizontal and vertical tank systems. The D-60 deep well pump has a load-balancing cylinder and silent

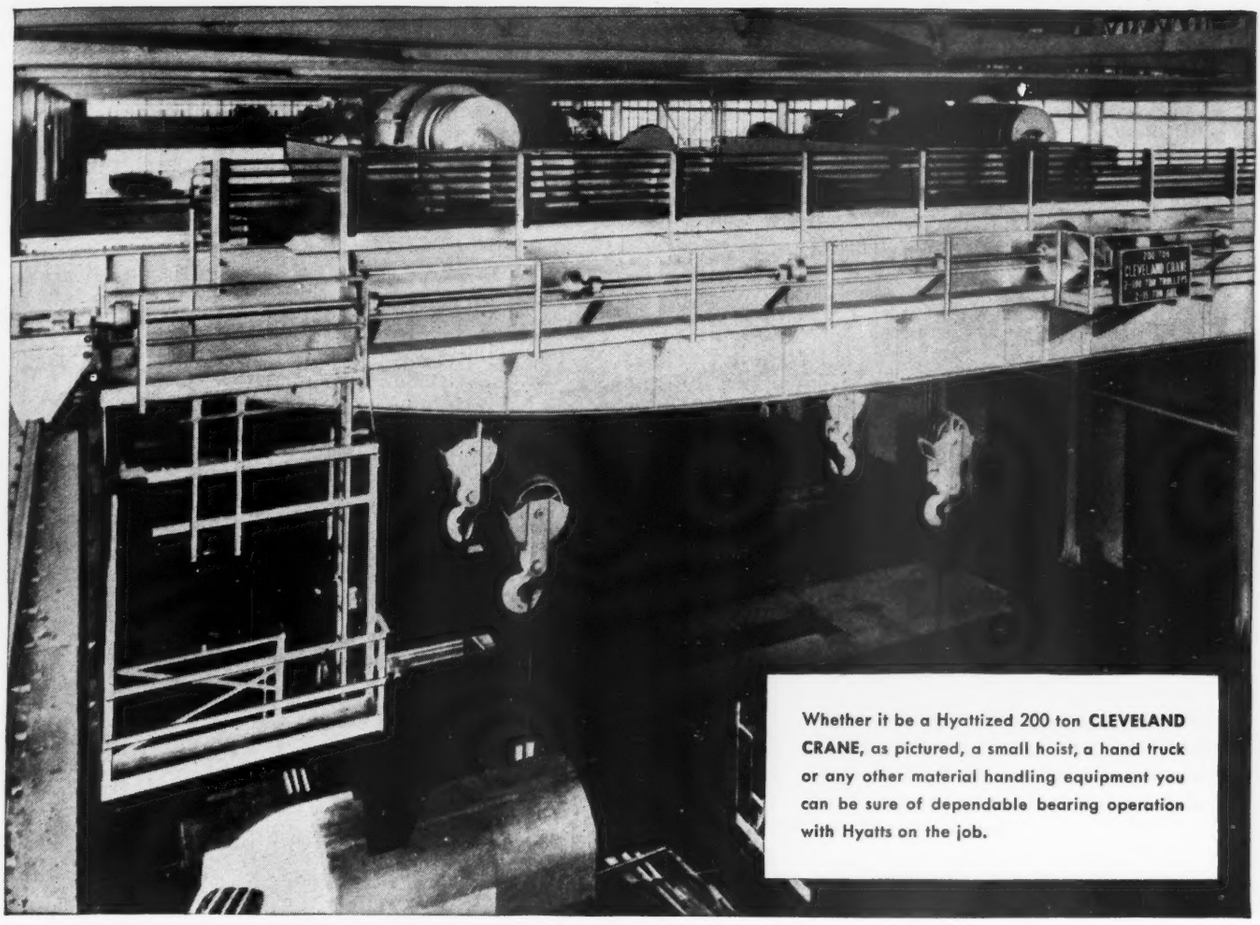


herringbone gears. Available with different sizes of load balancing cylinders. Crane Co., 836 South Michigan Ave., Chicago.

Air Filter

"Electro-Matic" air filter combines electrical dust precipitation with automatic air filtration. The front curtain filters heavier dust and material from the air. Fine dust passes through to the ionizing unit and receives an electrical charge, and upon entering electrostatic field of rear curtain the particles are attracted to charged plates and held there until removed as the curtain passes an oil bath. Entire casing of filter and front curtain is grounded. The ionizer is inclosed within the filter, and the rear curtain, which is the only exposed part carrying an electrical charge, is protected by a close-mesh grill. The filter curtain provides electrical insulation of plates and a means for charging or grounding alternate plates in certain sections of the curtain. Unit is made in standard sections of





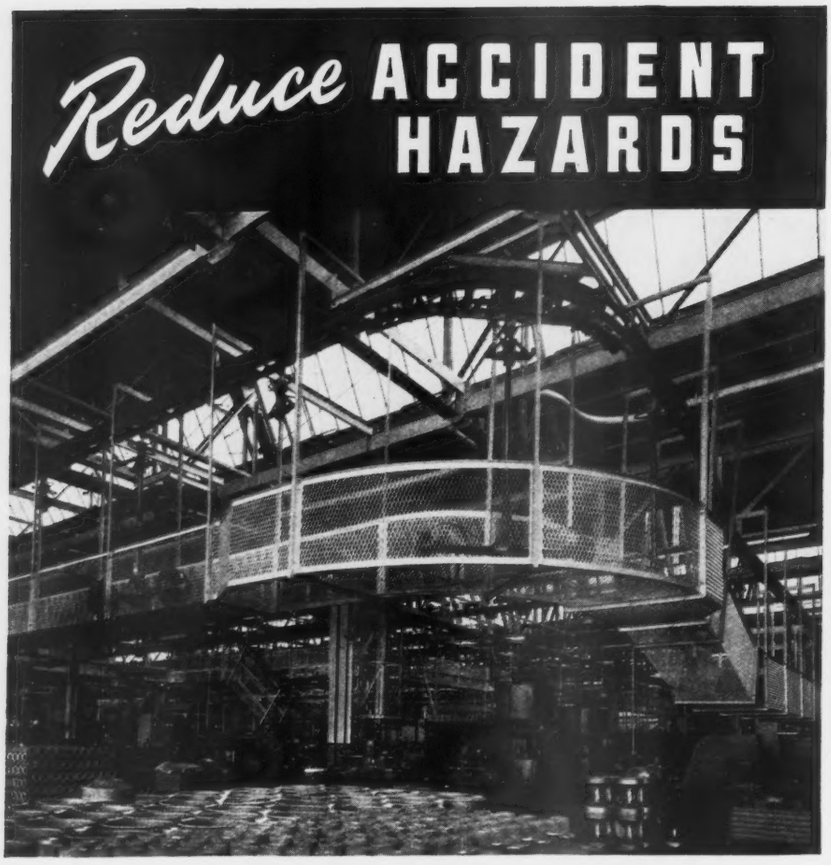
Whether it be a Hyattized 200 ton **CLEVELAND CRANE**, as pictured, a small hoist, a hand truck or any other material handling equipment you can be sure of dependable bearing operation with Hyatts on the job.

Toil... BUT NEVER TROUBLE... FOR HYATTS

Toil, however punishing, never spells trouble for Hyatt Roller Bearings. These durable and precisely built bearings maintain their efficiency, and the efficiency of related mechanism, under the most gruelling conditions of speed, stress and shock.

To the equipment builder they bring better design and manufacturing economies — to the equipment purchaser, longer machine life, more dependable operation and marked savings in maintenance. All hands benefit where and when Hyatts are used. Hyatt Bearings Division, General Motors Sales Corporation, Harrison, New Jersey; Chicago, Pittsburgh, Detroit and San Francisco.

HYATT *Roller* BEARINGS



with CONVEYOR GUARDS of Steelcrete Expanded Metal

WHEREVER moving parts are exposed you risk not only personal injuries to workers but damage to equipment and costly delays in production. With Steelcrete Expanded Metal you can build efficient conveyor guards at low cost. The open diamond mesh of Expanded Metal permits immediate "spotting" of articles dropped from the production line. Cut and expanded from sheets of steel, Expanded Metal has resilience to protect articles which may drop upon it, yet the strands will never separate or unravel. This practical material can be cut and bent in your plant to any shape to fit curves, inclines or angle turns or if you prefer, guards may be purchased ready for installation. Write for descriptive literature today.

"IT'S WHEELING STEEL"

THE CONSOLIDATED EXPANDED METAL COMPANIES
WHEELING, WEST VIRGINIA
Branch Offices and Warehouses:
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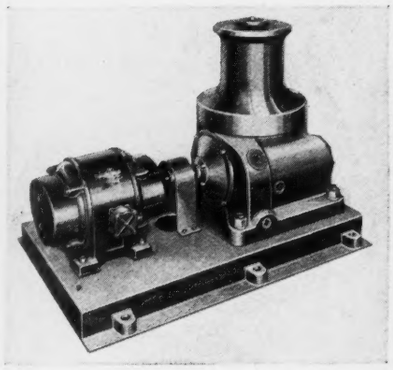
Export Office: 330 West 42nd St., New York, N. Y.

varying heights from 5 to 13 ft., single sections being built in 3- and 4-ft. widths with optional heights. The power pack is mounted on the casing and operates on a 110-volt, 60-cycle, single-phase, a.c. lighting circuit. American Air Filter Co., Inc., Louisville, Ky.

Car Spotters

Nos. 5-A and 10-A vertical-capstan electric car spotters have high-torque electric motor connected to drive mechanism by an incased flexible, roller-chain coupling, and



welded with the spotter on a welded steel base plate. Vertical capstan of semi-steel or cast steel is machine finished to lengthen life of haulage cable. A housing incloses the gearing. Ratchet and pawl, mounted inside capstan for holding cars on an incline when the power is off, are furnished when required. No. 5-A, capable of 5,000-lb. rope pull, moves one to three cars; No. 10-A, capable of 10,000-lb. rope pull, moves three to six cars. They have 5- and 10-hp. motors respectively. Link Belt Co., 307 North Michigan Ave., Chicago.

Foot Control Switch

"The 3rd hand" leaves both hands free to handle work at drill press, saw table, lathe grinder, and other powered tools. The foot plate is large enough to be located easily without moving eyes from work, and is set at an angle designed to be natural and untiring to the foot. The power tool motor runs so long as the foot is on the control and stops automatically when pressure is removed. Switch is rated 12 amp. at 125 volts, 6 amp. at 250 volts. The Leeds Electric & Mfg. Co., 1840 Broad St., Hartford, Conn.

Pipe Cleaner

Two motor-driven "Ferrets," Models A and B, work through traps, elbows, tees, and U-turns to open and clean clogged pipes, coils, sewers, drains, gas lines. Each model is equipped with an electric switch to reverse rotation of cable and to start and stop motor; a clutch handle to operate clutch jaws; cable outlet to pipe; slip-joint connection for 15-ft. rear cable guide; rubber-insulated electric connection wire; two handles; detachable base. Rotation of cable scours line, and clears up ordinary obstructions. In lengthening the original cable, a coupling fastens added lengths together. Model B weighs 85 lb.; for use

(Continued on page 104)

YOU NEED TO CLEAN TURBINE OIL SYSTEMS ONLY ONCE

● MANY operators will probably doubt that. Records that Nonpareil Turbine Oil has made in hundreds of turbines throughout the Midwest may be hard for you to believe until you've tried this different turbine oil yourself.

At the Blandin Paper Company at Grand Rapids, Minnesota, for instance, A. J. Kull, Chief Engineer, writes:

"It is now seven and one-half years since we cleaned our turbine oil system and changed to Nonpareil Turbine Oil.

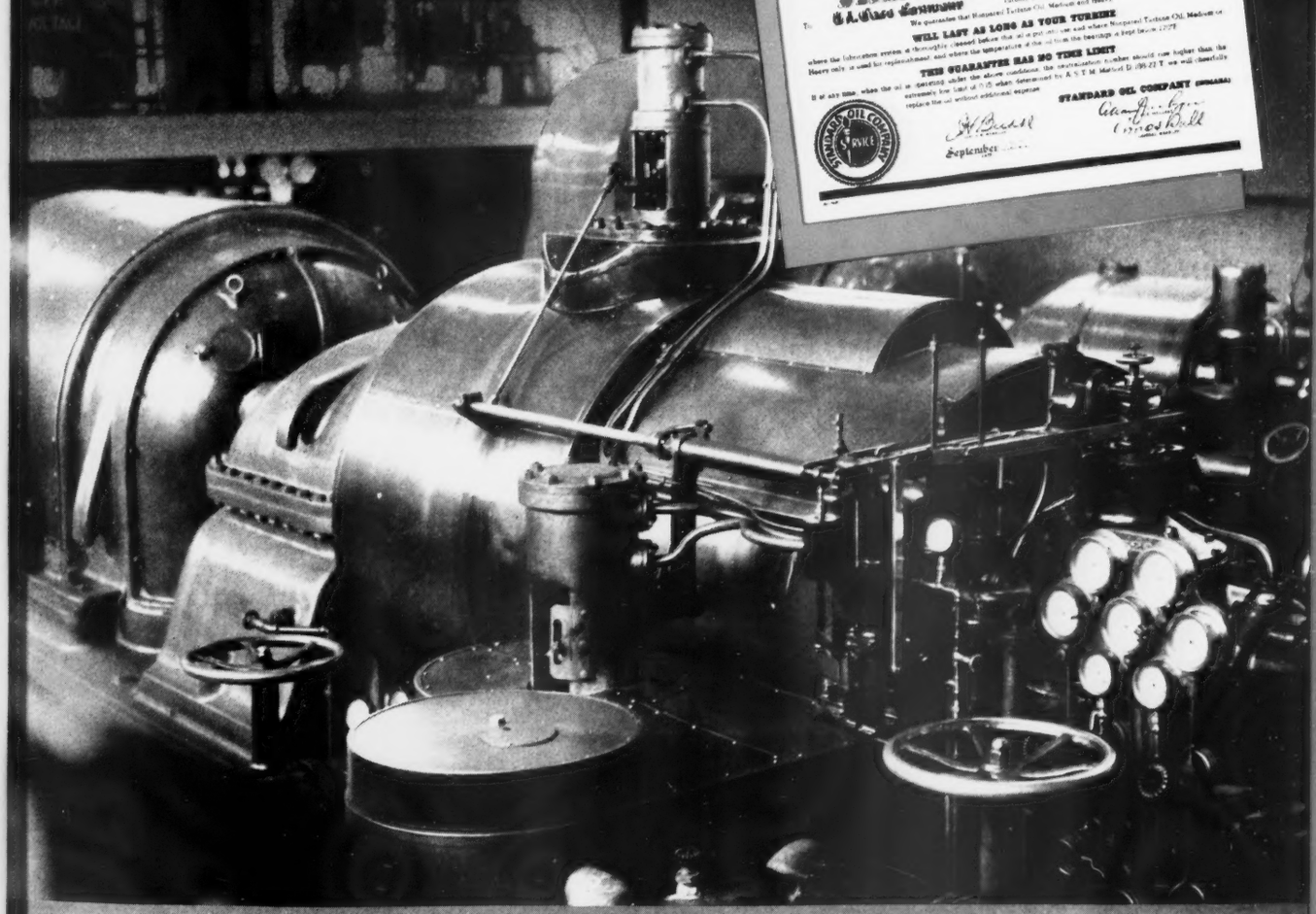
"During this period the oil cooler has been opened only once and we found it almost as clean as when the oil was first put in service.

"We shall be pleased to recommend this oil to any engineer who calls on us for our recommendation."

It is almost eight years since Mr. Kull has cleaned a turbine oil system or had the messy job of changing oil. Think of the saving in labor and oil costs he has made!

Why don't you try this modern Turbine Oil that is *guaranteed* to last as long as your turbine? Ask any Standard Oil (Indiana) lubricating representative about this guarantee.

Copr. 1939, Standard Oil Co. (Ind.)



STANDARD OIL COMPANY (INDIANA)

...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...

...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINE

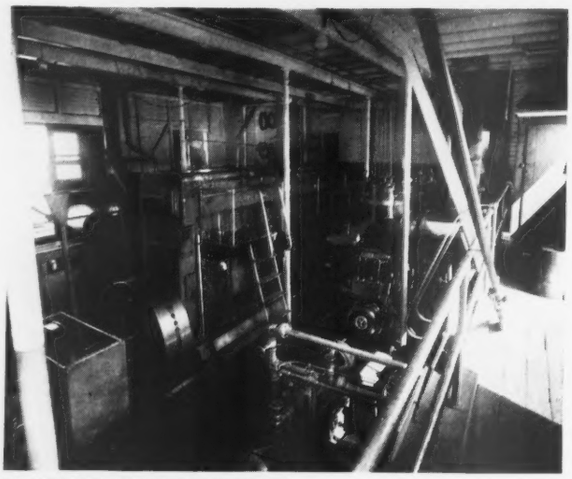
TESTS 17 BRANDS OF CYLINDER OIL.. PICKS

STANOCYL

Seventeen brands of cylinder oil were tested in the power plant of a Central State prison, on two steam engines, in an attempt to eliminate valve groaning under increased steam pressure and temperature. The only one of the 17 oils that gave really adequate lubrication was StanoCyl SH.

StanoCyl has been in use two years at this plant. There is every indication that the cylinders and valves are being lubricated even better than they were before the change to superheat was made.

Practically every test of StanoCyl shows lower consumption, cleaner exhaust steam and better lubrication under all steam conditions. You can easily prove this in your own plant. Let a Standard Lubrication Engineer help you.



NONPAREIL DIESEL OIL

Diesel-driven pumps on a sand sucker had to be shut down about once every six months to permit cleaning of valves, rings and pistons on the Diesel. That was no small job on this large 800 HP engine, and it also meant a loss of 300 yards of material moved for every hour the engine was down.

The dredge operator welcomed a test of Nonpareil Diesel Oil when the Standard Lubrication Engineer suggested it would reduce shutdowns. That was five years ago. After the first two years of operation on Nonpareil the rings and pistons were checked. They were in such good condition that they were put back just as they were found. Now, after five years, there is still no trouble from stuck rings and no lost time from cleaning the engines.

Test Nonpareil in your Diesel. See if you don't find an improvement in cleanliness *and* consumption.

FIND OUT WHAT YOUR LUBRICATING COSTS SHOULD BE...

Do you know that oil or grease consumption in your power plant or processing equipment is right, or that maintenance costs are in line? Here's an easy way to be sure that they are:

If your plant is located in any one of the 13 states shown below, ask your Standard Oil (Indiana) representative to have a Standard Lubrication Engineer see you.

Then let this Engineer make a survey of the lubrication of any particular machine, a whole department, or the

complete plant if you like. He'll tell you if improvements can be made, if lubricants are being wasted, and how to correct the trouble he finds.

When 40 Lubrication Engineers can point to better lubricating results or a money saving in practically every plant that they have serviced, it is fairly conclusive evidence that they can do either one or both for you. And it won't cost you a cent to find out.

The booklet "The Lubrication Engineer—His Value to You" offered in the coupon, tells you more about what this service is and how it works. Send for it today.

IF YOU ARE IN ONE OF THE 13 STATES SHOWN ABOVE SEND THE COUPON

STANDARD OIL COMPANY (Indiana), Room 1217
910 S. Michigan Ave., Chicago, Illinois

Gentlemen: Please send me the booklet checked:

☐ "Spare the Time to Spare Your Machinery."
☐ "The Lubrication Engineer—His Value to You."

Name.....

Company.....

Address.....

City..... *State*.....

TO HELP YOU JUDGE LUBRICATING OIL QUALITY

Whether you buy lubricating oil or are responsible for the equipment on which it is used, the booklet "Spare the Time to Spare Your Machinery" will give you helpful suggestions for determining desirable qualities in an oil.

It describes terms like Demulsibility, Stability and Viscosity Index and explains their importance in determining the type of oil for various services. A convenient source of facts about oil which you can use to advantage.

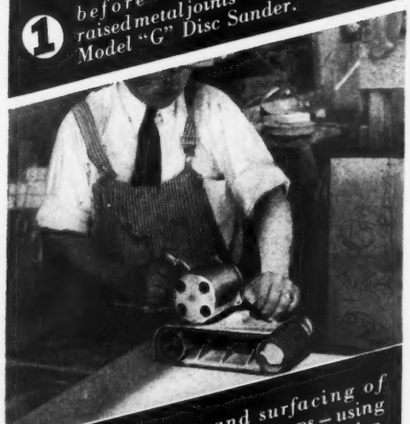
One Tool Sold Another!

...now this ONE plant uses

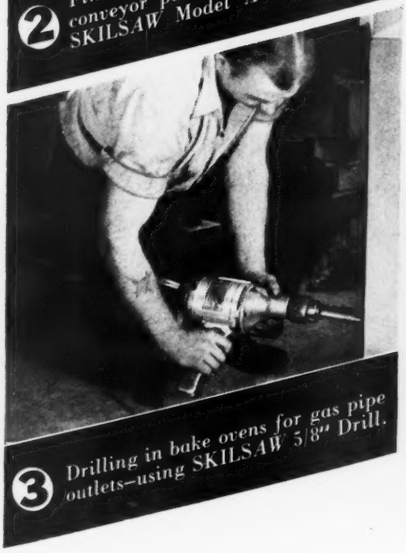
SKILSAW TOOLS

on Five operations!

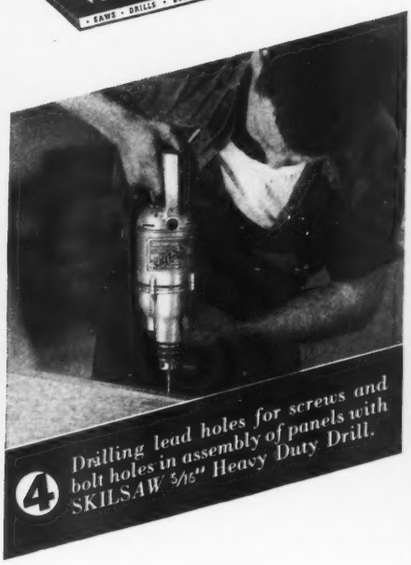
1 Sanding spot welds, cleaning metal *before enameling*, smoothing raised metal joints—using SKILSAW Model "G" Disc Sander.



2 Final sanding and surfacing of conveyor pastry table tops—using SKILSAW Model "A" Belt Sander.



3 Drilling in bake ovens for gas pipe outlets—using SKILSAW 5/8" Drill.



4 Drilling lead holes for screws and bolt holes in assembly of panels with SKILSAW 3/15" Heavy Duty Drill.

5 Grinding raised welds, using SKILSAW Disc Sander with specially designed Grinding Wheel.

Could you ask for better proof of the cost-cutting performance of SKILSAW TOOLS? Annetsberger Bros., Chicago, manufacturers of bakery and brewery equipment have made these 5 operations (slow and costly when done by hand!) fast and profitable by the use of SKILSAW TOOLS... each tool's performance had led to the purchase of another until today a large number of SKILSAW TOOLS are saving money and increasing production throughout the plant! Ask for a free demonstration of SKILSAW TOOLS on your own work... and you'll see why they *belong* in YOUR plant!

SKILSAW, INC.
5043 Elston Ave., Chicago

214 E. 40th St., New York. 52 Brookline Ave., Boston. 1429 Spring Garden, Philadelphia. 2124 Main St., Dallas. 918 Union St., New Orleans. 1253 S. Flower St., Los Angeles. 2065 Webster Avenue, Oakland.
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Sold by leading distributors of mine, mill, hardware and contractors' supplies.

SKILSAW
PORTABLE ELECTRIC TOOLS
SAVE MONEY IN EVERY INDUSTRY!
• SAWS • DRILLS • BELT SANDERS • DISC SANDERS • GRINDERS • BLOWERS •

KARDEX CUT INVENTORY 11% WHILE SALES INCREASED 30%

THE EXPERIENCE OF Allen-Bradley Co.

Prominent electric control manufacturers, Milwaukee, Wisconsin

Two principles of Kardex Stock Control helped the Allen-Bradley Company of Milwaukee cut their inventory 11%, while sales were increasing 30%.

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These results are not at all unusual. Thousands of firms in hundreds of lines of business do as well or better with Kardex Stock Control. Their experience is one of the most significant stories in current business history.

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If you have Kardex Stock Control records now, find out how a few changes will add the modern improvements which are saving money for Allen-Bradley.

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Name.....

Firm.....

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City & State.....

WE HAVE DEVELOPED MANY UNIQUE SYSTEM SERVICES AND PRODUCTS

See if Remington Rand *Makes it!*

(Continued from page 100)

on ¾- to 8-in. pipe. Model A weighs 45 lb.; for use on ⅜- to 2-in. pipe. Pittsburgh Pipe Cleaner Co., 213 Oliver Bldg., Pittsburgh.

Platform Ladder

Over-all height of "Safety" platform ladder ranges in eight sizes from 5 ft. 7 in. to 14 ft. 6½ in. Weight ranges from 29-85 lb. Working platform, approximately 3 ft. below top working shelf, is constructed with

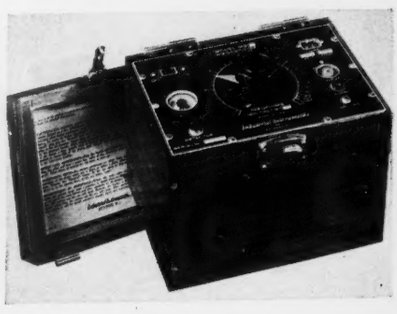
band-steel platform guard rails on three sides. Tool holder is provided at top. Steps are trussed with hardwood blocks and ¼-in. cadmium-plated rods, and have steel angle braces under alternate steps. Back legs are supported with double-rodded tiebeams and cantilever bracing provides rigidity. Lock prevents unexpected closing. For rust-resistance, the ladder is hardware-painted or cadmium-plated. The Goshen Mfg. Co., Goshen, Ind.

Drill

A 5/16-in. utility ball bearing drill for maintenance and repair work has a no-load speed of 1,100 r.p.m., capacity of 5/16 in. in steel and ⅝ in. in hardwood. Can be used with carbon bits. Deep-groove ball bearing on chuck spindle, with inner and outer races locked in place, absorbs thrust in all directions; splined gear mounting on spindle increases strength and reduces noise and wear; removable commutator covers allow for brush inspection. The Van Dorn Electric Tool Co., Towson, Md.

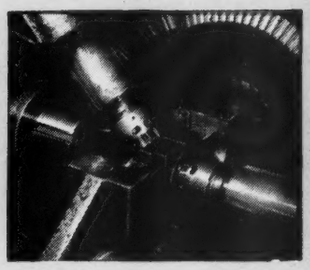
Insulation Tester

"Megabridge," an insulation-resistance measuring instrument, tests electrical equipment, waxes and oils, insulating ma-



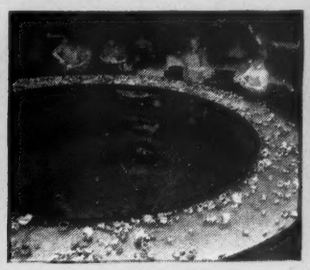
From Metal To Final Inspection They Must Be Right!

OOTH cores for free flow skilled core-makers using materials assure smooth finish in Grinnell Fittings.



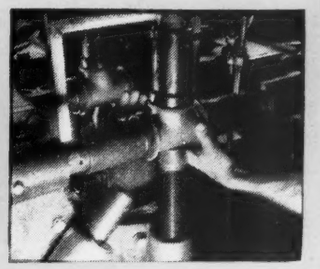
ACCURATE jaws hold the fitting as sharp taps cut the clean threads that mean easy running up and tight joints.

ORM wall thickness and th finish are assured by grade pattern equipment careful setting of cores.

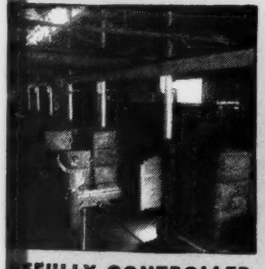


RIGID INSPECTIONS check the fittings at three points in their manufacture to maintain the Grinnell standard.

ERIOR metal is poured fully to make these fittings der direct supervision of man responsible for each ing floor.

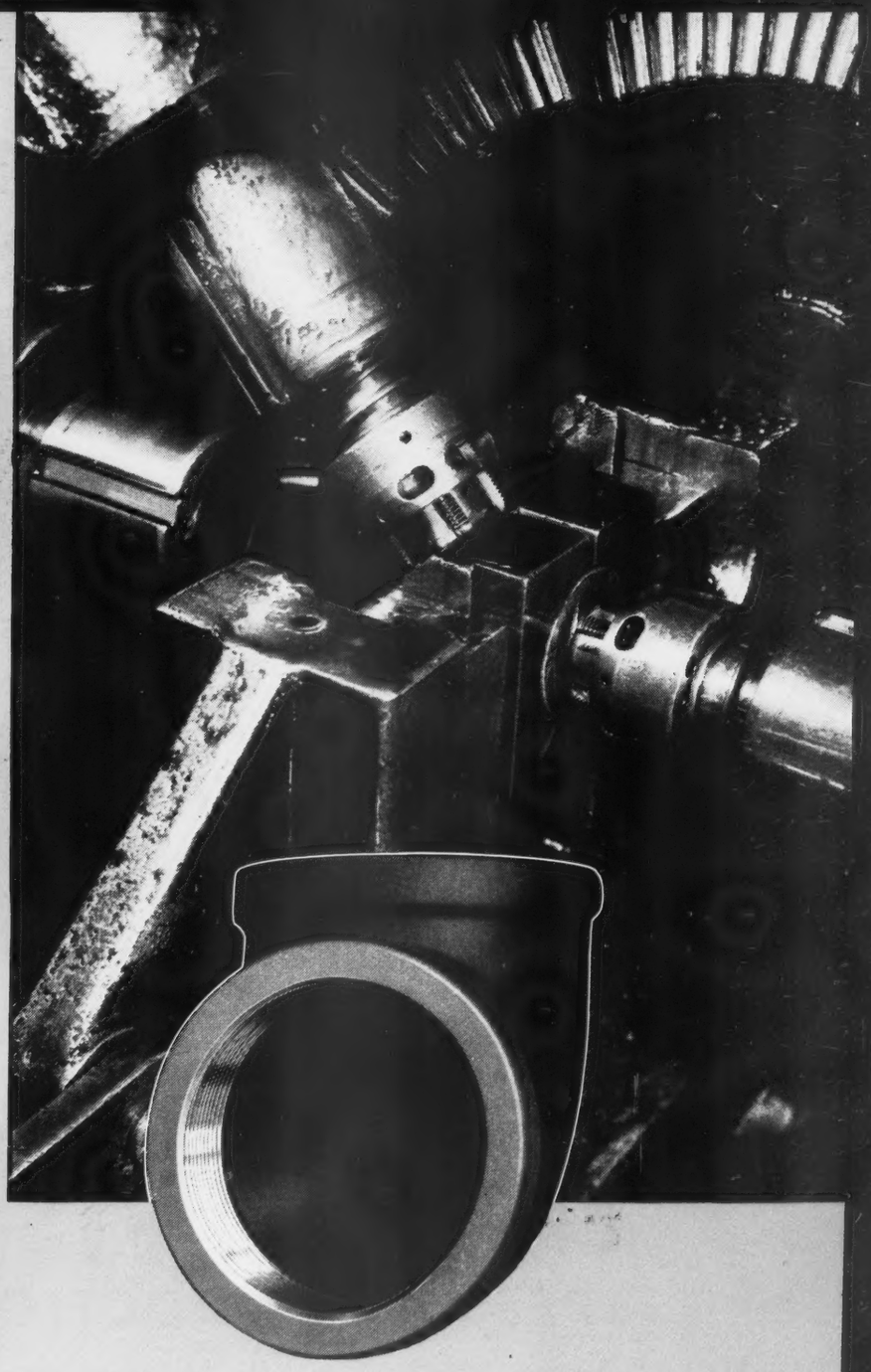


STRENGTH is checked by sample tests in hydraulic machines which force oil under tremendous pressure into the fittings.



EFULLY CONTROLLED ling eliminates strains in ttings castings . . . gives rugged strength to take in service.

DIMENSIONAL ACCURACY is checked on test fittings by methods like that shown . . . testing a 2" tee with steel square.



CLEAN, SHARP THREADS

Up To Grinnell Standard!

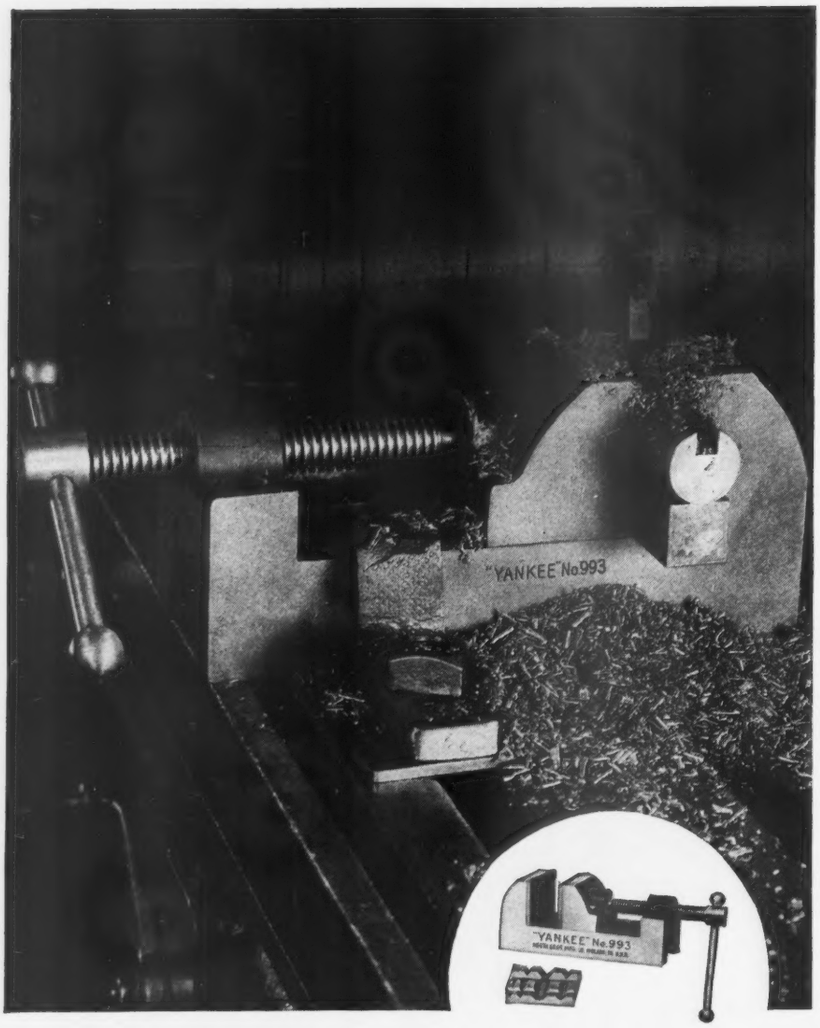
Fittings—as nearly perfect as you want a fitting to be! That's the standard every fitting must meet to bear the Grinnell trade mark. The photographs at the left show why it takes more than good materials alone . . . or good workmanship alone . . . to meet it.

Sub-standard fittings can be the weak link in any piping system. For easy installation, tight joints, and long, trouble-free service, choose from the wide line that bears the Grinnell "G." Write for Catalog 4, free on request. Grinnell Company, Inc., Executive Offices, Providence, Rhode Island. Branch offices in principal cities.

ST . . . AIR FURNACE MALLEABLE IRON STEEL . . . BRONZE FITTINGS BY

GRINNELL

WHENEVER PIPING IS INVOLVED



"YANKEE" VISE
SPEEDS PRODUCTION

"Yankee" is a *fast-production* vise—different from any other vise in your shop! Squared all sides. Designed for continuous work—from bench to machine and back again—accurate results and no delay. "Yankee" Vise illustrated above, made in four sizes: No. 991, 1½" jaw width. No. 992, 2" jaw width. No. 993, 2¾" jaw width. No. 994, 4" jaw width. Hardened steel block, V-grooved, supplied for holding rounds.

"Yankee" Vise also available with removable swivel base. Sizes, Nos. 1991, 1992, 1993 and 1994.

ORDER FROM YOUR SUPPLY HOUSE. FOR "YANKEE" VISE CIRCULAR, WRITE NORTH BROS. MFG. CO., DEPT. F, PHILADELPHIA, U. S. A.

NORTH BROS. MFG. CO., PHILADELPHIA, U.S.A.

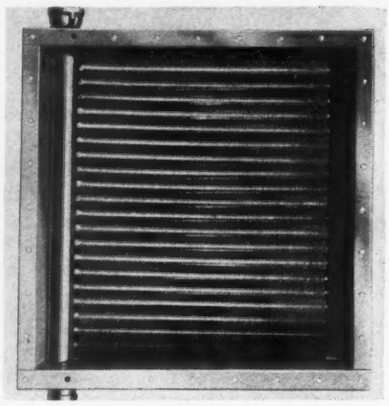
terials, leakage of cables and wiring. Electrically, it is an adaptation of the Wheatstone bridge utilizing an electron ray "null indicator," instead of a galvanometer, as a "null detector." Operating on a.c., the Megabridge has a self-contained d.c. supply for the bridge circuit and electron ray tube. Calibration is not affected by fluctuations of line voltage or tube variations. High-potential terminal is guarded so that leakage over surface of terminal insulation does not affect calibration. High humidity conditions do not affect calibration either. A built-in voltage regulator eliminates fluctuations in charging current and voltage. Housed in a wood cabinet it measures 8x7x5¾ in. Eight models, for 115 and 230 volts, 25-60 cycles, have various capacities ranging 100,000 ohms to 100,000 megohms. Industrial Instruments, Inc., 162 West 23d St., Bayonne, N. J.

Files

Rotary files ground from the solid after hardening, are made of high-speed steel, and can be re-sharpened many times. Grobet File Corp. of America, 3 Park Place, New York.

Heater Sections

Either steam or hot water may be employed for heating, and cold water or refrigerant for cooling, with the "Feather-fin" heating and cooling section. Hairpin construction of finned copper tubes protects section against expansion and contraction strains. The tubes are secured to headers by a mechanical compression joint and are individually replaceable. The sections are



said to offer low resistance to air flow. Available in two types: Standard, in which steam is turned on, off, or throttled to obtain temperature control; "Safe-Against Freezing" V.T. type, which eliminates possibility of freezing when steam is turned alternately on, off, or throttled. This section permits close control of temperature of air discharged. It is used for supplying fresh air or where inside air is recirculated. Built-in air bypasses, controlled either manually or automatically, provide control of temperature of discharged air stream. L. J. Wing Mfg. Co., 154 West 14th St., New York.

Gas Valves

Slow-acting gas valves that provide a soft ignition at low flame followed by a

"RED" IS HERE

To Help You Cut Your Maintenance Costs!!

G-E 1201 Glyptal Red will protect your motors, controls, and insulation from ARCING, MOISTURE, HEAT, OIL, ACID, ALKALI, DUST, and SALT AIR. Glyptal Red is an air-drying or quick-baking Glyptal. It's famous as a protective coating on coil windings, metallic surfaces, porcelain, molded insulation, etc.

HERE'S WHY IT CAN DO A FINE JOB FOR YOU:

1. *High heat resistance.*
2. *Non-carbonizing under arcing.*
3. *Prolonged resistance to mineral oils.*
4. *Resistant to kerosene and gasoline when baked.*
5. *Resistant to sodium carbonate and oleic acid.*
6. *Resistant to adherence of dirt due to its smooth, hard, glossy surface.*
7. *Comparatively high dielectric strength.*
8. *Tenacious adherence to underlying surface.*
9. *High degree of flexibility.*

GLYPTAL RED HAS HELPED TO CUT MAINTENANCE COSTS IN MANY PLANTS

Let it help you, too. Glyptal Red, like all other G-E Insulating Materials, has been developed to give lasting, economical protection to electrical equipment.

If you have not received a Glyptal Red folder from your G-E Distributor, send this coupon to us immediately. We'll send it to you in a hurry!

GENERAL ELECTRIC

Section M-9105, Appliance and Merchandise Department,
General Electric Company, Bridgeport, Connecticut.
Please send me the new Glyptal Red Folder right away.

Name.....

Company.....

Address.....

Top Quality BRUSHES

The Pittsburgh Plate Glass Company offers brushes for every industrial need.

Gold Stripe Brushes

Made of Pure Black Chinese Bristle—selected and mixed by master craftsmen. Each brush planned for maximum carrying capacity and designed for a specific paint application.

Industrial Brushes

Floor Sweeps, Mill Dusters, Wire Scratch and Casting brushes. Also Spiral Wound brushes of wire, horsehair and tampico for large scale production.

Investigate. You can save money by concentrating your brush purchases in this one reliable source of supply.

Overnight Service

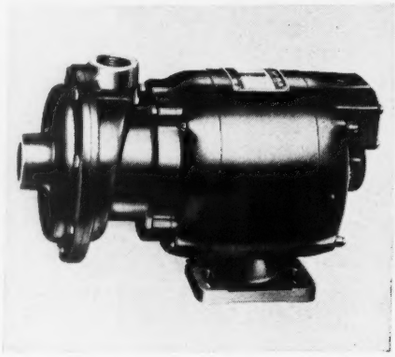
For the convenience of its customers, the Pittsburgh Plate Glass Company maintains 78 centrally located service warehouses. Orders for brushes are regularly filled on a 24 hour basis.

PITTSBURGH
PLATE GLASS COMPANY
BRUSH DIVISION · BALTIMORE, MD.
WAREHOUSES IN 78 IMPORTANT MARKET AREAS

gradual opening to full flame, incorporate a snap primary flow of adjustable volume, a hesitation period allowing time for uniform draft to be established, and followed by slow opening to full capacity. Closing cycle is snap-acting. Two sizes: ¾- and 1-in. pipe tap. Valves operate on 20 volts. Julien P. Friez & Sons, Baltimore.

Pumps

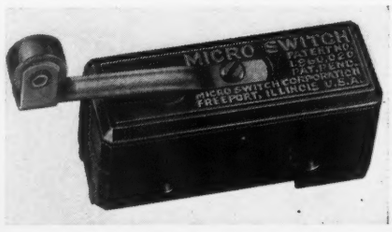
Centrifugal "Motorpumps" Nos. 220 and 240, for supplying coolant for machine tools and light machinery, for use where space is limited or power take-offs not easily available, where dirt or abrasives may be present in the liquid, and for light transfer work, supply a moderate volume of flow at low head and can be furnished with motors of various electrical characteristics. No. 220 is for operation with impeller be-



low liquid level, can be mounted either horizontally or vertically—the motor preferably above the pump. A mechanical seal protects leakage of liquid. The pump discharges radially from center of rotor assembly. The discharge port can be positioned at any 90 deg. angle with respect to motor by shifting pump assembly on motor end bell. No. 240 is similar to No. 220 but has flange mounting integral with pump and does not require inlet piping. Can be used in vertical or horizontal position. Discharge port can be shifted to any 45 deg. angle with the intake or suction. Brown & Sharpe Mfg. Co., Providence, R. I.

Switch

Roller-leaf-actuated "Micro Switch," for service where low moving power is available to make or break circuits, in applications requiring low friction, minimum change of operating point through wear, where roller action is needed between cam and switch lever. Can be used to control



motors, heaters, solenoids from cams, slides, or rolls. Switch is of single-pole construction with normally open, normally closed, or double-throw contact arrangements. The leaf spring is ribbed stainless steel. The case-hardened roller is mounted on an oilless bronze bearing. Switch measures 2½x1⅜x¾ in. and handles ½ hp. Stand-

"... take a letter to the boss!"

HERE'S A LIFT TRUCK THAT HAS *Everything!*

● If your materials handling crews specified lifting equipment, they'd say: "Dear Boss—Give us a few of those new Service Single Stroke jobs . . . and watch our smoke."

Featuring faster lifting, lowering and towing . . . and an ease of lift that leaves operators as fresh after a heavy afternoon schedule as they were at ten in the morning . . . this production-boosting, cost-saving brute will breeze through years of the toughest assignments any lift truck ever had.

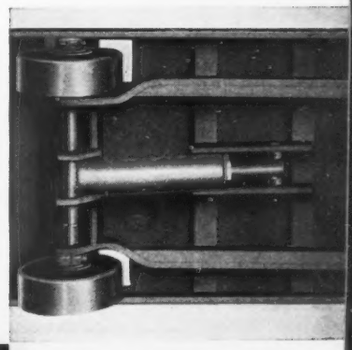
Here are four reasons why it goes places and does things beyond the capacity of ordinary lift trucks: (1) With only 100 pounds on the handle a single stroke lifts the capacity load; (2) Complete "handle-to-the-side" lift permits operation of the handle from any spot in a horizontal arc of 180 degrees; (3) Ten-inch Hyatt roller bearing wheels in front, widely spaced, make for easiest rolling under heavy loads and insure a wagon-like stability; (4) Headroom is extremely short. This, combined with the handle-to-the-side lift, makes it impossible to corner this truck. Standard in 2,000, 2,500 and 3,500 pound capacities. Custom-built in almost any desired capacity and size. Write for full facts on these and other equally desirable plus features.

SERVICE CASTER & TRUCK COMPANY

505 N. Brownswood Ave., Albion, Mich. - Eastern Factory: 434 Somerville Ave., Somerville (Boston), Mass.

Sole Canadian Licensee: The Service Caster & Truck Division of United Steel Corp., Ltd., at Toronto

Here's a bird's-eye view of the inner mechanism which distinguishes this new lift truck. Note the heavy-duty roller chain, the sturdy lifting stud, and the easily removeable head.



A close-up of the truck's Atlas-like construction. Built like a locomotive, this truck is solid steel from platform to supporting members . . . fused together in one rigid unit by masterly electric welding.

SERVICE *Single Stroke* LIFT

They're Built Rigid...

and stay that way

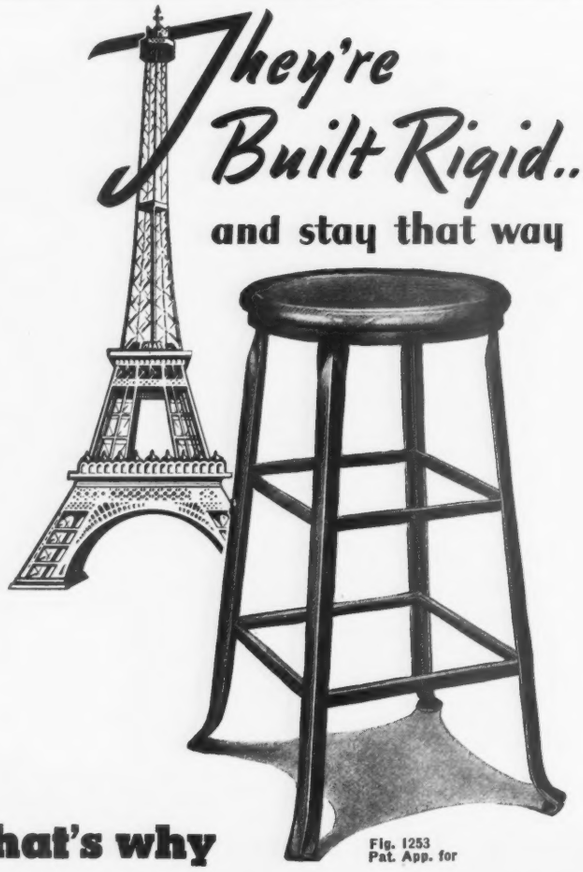


Fig. 1253
Pat. App. for

...that's why

Industry chooses and prefers

"HALLOWELL"

STEEL STOOLS

You, too, can be sure of getting maximum value for every cent you spend on seating equipment. Simply do as hundreds and hundreds of other industrial firms are doing . . . specify "Hallowell."

They have the full-welded, practically one-piece construction that keeps them firm and rigid indefinitely. No weak riveted joints to loosen up . . . no chance for them to get rickety and wobbly after a little service. You'll find replacement costs hit bottom when you standardize on "Hallowell."

Fig. 1267

There are so many different types of "Hallowell" Stools and Chairs for you to choose from you're sure of getting the exact style to best suit your needs and to enable your employees to handle their work most efficiently.

Our catalog shows them all. Send for a copy.

Fig. 1249
Pat. App. for

STANDARD PRESSED STEEL Co.

BRANCHES
BOSTON
DETROIT
INDIANAPOLIS

JENKINTOWN, PENNA.
BOX 546

BRANCHES
CHICAGO
ST. LOUIS
SAN FRANCISCO

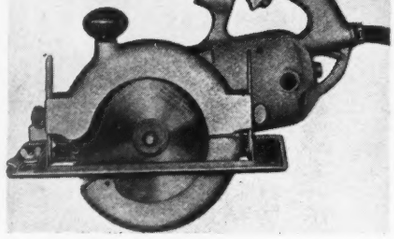
ard or Type Z Micro Switch can be obtained with the roller leaf actuator. Switch can also be supplied with metal-clad housings. Micro Switch Corp., Freeport, Ill.

Fan

"Axiflo" pressure fans for operation against wind resistance or the resistance of filters, baffles, discharge conduits, and the like, discharge up to 75,000 cu.ft. of air per min.—wind direction, velocity or fan location having very little effect on air delivery. Adapted for almost any industrial application—heating, ventilating, cooling, mechanical draft, drying, humidifying, and fume, vapor, or dust removal. The casings are heavily built and fitted with streamline inlets. Wheels are of solid, cast, heat-treated aluminum alloy which is non-corrosive under the action of most acid-content chemical fumes. Available in 11 sizes: 18- to 60-in. diameter for belt drive for floor or platform mounting; 18-42 in. for belt drive for wall or ceiling mounting; 18-42 in. for direct-connected motor drive—18-36 in. for wall or ceiling mounting, 42 in. for floor or platform mounting. Fans are furnished with saddles for motor mounting. B. F. Sturtevant Co., Hyde Park, Boston, Mass.

Saw

No. 25-S saw with tilting base for one-handed operation saws lumber, composition board, soft metals. When equipped with

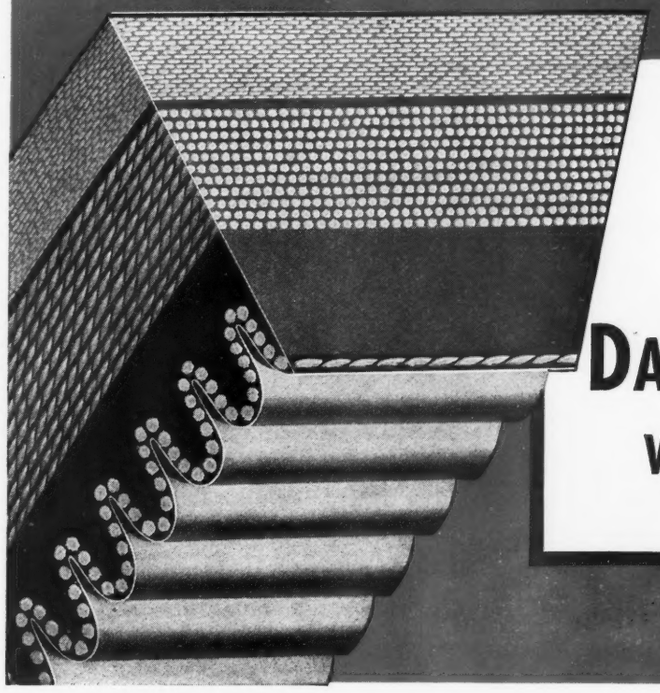


thin abrasive disks in place of saw blades, it can cut and score tile, stone, brick, granite, marble, fiber, steel sheets. Capable of cutting 2½-in. material at 90 deg., and 1¾-in. material at 45-deg. bevel. The saw blade is totally inclosed in a telescoping safety guard. An oversize, universal electric motor drives the arbor shaft through silent worm gears. Equipped with three precision ball bearings on motor shaft, two on arbor shaft. Syntron Co., 480 Lexington Ave., Homer City, Pa.

Controller

Series 3200 potentiometer controller is adapted to actuate any type of fuel valve or electric contactor. A 0.002 in. movement of galvanometer pointer is said to produce instantaneous control action. All electric design, the controller is non-mechanical. Incorporates "null type principle" eliminating errors due to external resistance changes and temperature coefficient of galvanometer; built-in signal light to indicate control action; automatic compensation for thermocouple cold-junction temperature by means of resistance thermometer. The con-

For Lower Upkeep of Drives and Machinery



DEMAND *Super-Flex* DAYTON COG-BELTS WITH DAYTEX CORD

TO STEP-UP YOUR PRODUCTION—to lower the upkeep of your drives and machinery Dayton's famed technical laboratories spent 7 years developing these new Super-Flex Dayton Cog-Belts with Daytex Cord in their neutral axis section.

STEEL-LIKE IN STRENGTH, Daytex Cord is made from highest grade long-staple, hard-bodied cotton. A bonding compacting agent removes, during the process of manufacturing, the non-essential oils and waxes from the individual fibres. As a result, the fibres interlock and form a stronger, yet more compact cord.

SMALLER IN DIAMETER because of Daytex Processing this Super-Flex Cord averages 22% less diameter—it stands up under constant high speed flexing. It has greater tensile strength. Furthermore, it has lower stretch and, due to interlocked fibres, has minimum tendency to become lifeless.

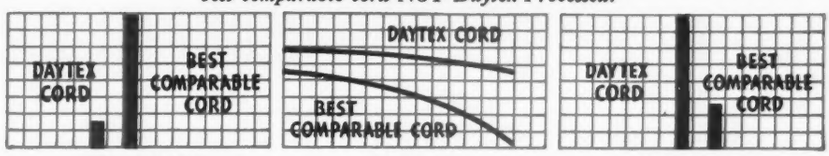
COOLER RUNNING because highly developed rubber compounds are forced into and around each individual cord, this denser Daytex Cord is made by patented Latexing and Calender Processes, which have been pioneered and constantly improved by Dayton for 19 years.

OUTSTANDING IN BASIC DESIGN, Super-Flex Dayton V-Belts are built to bend with patented cog construction. They work on short centers—save space—assure longer life and lower upkeep. Call your local Dayton distributor or write for Catalogs and data.

THE DAYTON RUBBER MFG. CO.
DAYTON, OHIO

FIELD EXPERIENCE CONFIRMS THESE LABORATORY TESTS WHICH PROVE THE OUTSTANDING SUPERIORITY OF DAYTEX CORD

The Charts below show tests of Daytex Process Cord versus best comparable cord NOT Daytex Processed.



LESS STRETCH *Stretch test-cords.*

STRONGER *Tensile test-cords.*

LONGER LIFE *Belt flexing test.*

Super-Flex
Dayton
COG-BELT DRIVES WITH DAYTEX CORD

MADE BY THE WORLD'S LARGEST MANUFACTURER OF V-BELTS

Protect Your Workers with MORTON'S SALT TABLETS

Heat-Fag is real — an unseen but powerful force that rides every hot wave . . . a force that costs industry thousands of dollars each year. For, hot days and heavy work make men sweat — and, unless the salt that's sweated out of their bodies is replaced, Heat-Fag takes its toll, production sags and profits suffer. This fact is known by medical men everywhere and by safety directors, executives and plant superintendents.

Prevent HEAT-FAG in Your Plant

Place Morton's Salt Tablet dispensers at drinking fountains. These modern, sanitary dispensers represent the most efficient and economical way to provide workers with salt. A single push of the lever dispenses one tablet at a time.

MORTON'S SALT TABLETS
Dissolve in 50 Seconds

They are easy to take — dissolve quickly. Only the purest and most highly refined salt is used.

Anticipate the Hot Days Ahead

Install Morton's Dispensers and Salt Tablets in your plant now. Place your order today. Remember — a small investment now will pay big dividends in Heat-Fag protection. Shipment will be made promptly — prepaid.

Write for folder—"Heat-Fag"

MORTON SALT COMPANY
CHICAGO, ILLINOIS

troller may be used outside without danger of freezing as it has no standard cell to be affected by low temperatures. No lubrication is necessary. Wheelco Instruments Co., 1929-33 South Halsted St., Chicago.

Conveyor Support

Adjustable floor support for conveyors has a zig-zag slot in the adjustable foot portion that prevents slipping under heavy loads. This slot holds the leg in position, thus eliminating the necessity of drawing the nut up very tight. This assures correct alignment for the carrying surface, and simplifies adjustment when changes in height are necessary. Logan Co., Inc., Louisville, Ky.

Voice-Powered Telephones

The "Telfair Telfone," French phone type, is voice-powered, non-magnetic, and is said to be unaffected by changes in climatic conditions. As a privately owned telephone intercommunication system, it permits executives to talk to all departments simultaneously, allows as many conversations to be carried on at once as there are pairs of phones; carries whispers clearly; comes equipped with selector dials for multiple station systems or without dials for party line or two-station use. Model A is a desk set; Model B is for desk or wall use. Telfair Telfone Corp., Chrysler Bldg., New York.

Skid Jack

The "Rollaway" jack, used in conjunction with "Re-Nu Top" skid platforms, is mounted on rubber-tired wheels revolving on roller bearings set on a high carbon steel axle. For balance, an equalizing spring is inclosed in handle tube. It forces handle upright when platform is elevated.

A deep wide-open prong pocket, set in front of hole to guide connecting skid platform, keeps the handle at angle for insertion when making connection with platform. Connection can be made with one hand; locking is automatic. The "Re-Nu Top" skid platform is mounted on roller bearings and set on axles of high carbon steel. By using a sub-frame, all units of the platform are welded into one whole, but one board or the entire top may be replaced without breaking the weld. The Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia.

Bin

Stacking assembly bin that can be put on the assembly bench keeps parts within fingertip reach. Sloping floor feeds contents toward front. Bins can be stacked

Rockefeller Center

AIR-CONDITIONING EQUIPMENT HAS 100 SKF-EQUIPPED FANS

THOUSANDS of tourists and talented players who swarm daily into the Music Hall, Center Theater, and other buildings at Rockefeller Center, little realize how the fresh air they breathe is carefully filtered and brought to them. They seldom think of a battery of nearly 100 SKF-equipped fans from 3′ to 16′ in diameter that are located in out-of-the-way places difficult to get at.

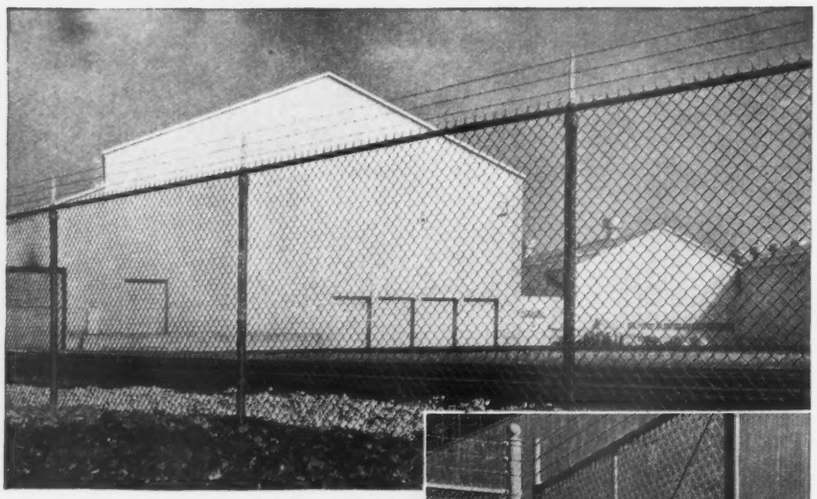
SKF Bearings are invariably selected for outstanding engineering projects because engineers learned long ago to depend on them for *quiet, efficient* and *smooth* operation. 4278

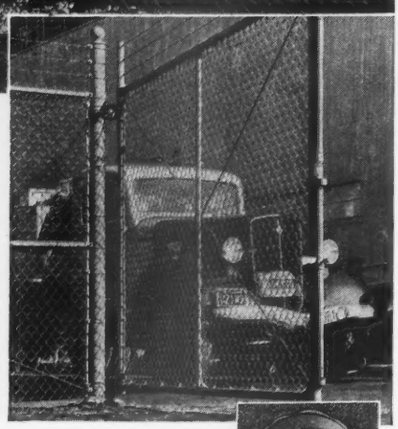
SKF INDUSTRIES, INC., PHILADELPHIA, PENNA.

Not only do SKF Bearings work well on BIG fans, but on thousands of warm-air furnace and attic fans, too. Once they are installed, you can forget them.

How to Choose the Right Fence

FOR YOUR BUSINESS PROPERTY





YOU want a sturdy fence that will safely guard every foot of your property line . . . one that looks well, will last for years and not require costly repairs. There's no economy in leaving your property an easy prey for thieves and marauders.

But, what is the *right* fence? How to choose it? Much depends on your type of property and many other factors. Our free book on fence will help you select the most practical fence for your needs. This 32-page book illustrates 14 different kinds of fence—tells you what kind you need for business, playground, school or residential property. Tells you how to get fence with rails that won't buckle—gates that won't drag or slip—how to get extra protection against rust with fence that is galvanized *after* weaving.

Whether you need a few feet of fence or miles of it, whether you are planning to build a fence now or later, you need this valuable book. So mail the coupon. And remember that upon request you can have the services of a Cyclone factory-trained engineer. He will help solve your fence problem and give you an accurate estimate of cost. There is no charge for this service.

Now you can be sure of the quality of fence before you buy it. Cyclone Fence with the "12M" label has an extra-heavy coat of galvanizing that resists rust and makes the fence last longer. Be sure that the "12M" label is on the fence you buy.

CYCLONE FENCE COMPANY
General Offices: Waukegan, Illinois
Branches in Principal Cities
Standard Fence Company, Oakland, Calif.,
Pacific Coast Distributors
United States Steel Products Co., New York,
Export Distributors

Send for **FREE** *Illustrated Book*

USS
CYCLONE FENCE

CYCLONE FENCE Co., Dept. 959
Waukegan, Ill.
Please mail me, without obligation, a copy of "Your Fence—How to Choose It—How to Use It."
Name.....
Address.....
City..... *State*.....
I am interested in fencing: ☐ Industrial Property; ☐ Playground; ☐ Residence; ☐ Estate; ☐ School. Approximately.....feet.

UNITED STATES STEEL

one above the other. Four in. wide in back and 3 in. wide in front, they can be set up in a semicircle. They measure 8 in. long, 2½ in. deep, and are made of heavy-gage sheet steel, welded construction. Stackbin Corp., 50 Troy St., Providence, R. I.

Drill Press

Medium-duty drill press has a six-tooth spline drive—teeth of involute type. The spindle is mounted with four ball bearings, two of which form part of the mounting of the steel driving sleeve in which the internal splines are broached. The other two bearings are spaced widely to increase spindle support. Housing of spindle quill and quill itself is sufficiently long to leave as much quill within its bearing in the housing when quill is fed out to the limit, as extends outside the housing, thus insuring accuracy in deep boring, routing and mortising. A guard hinged to the head seals in the driving mechanism. Operating speeds: 500, 925, 1,750, 3,250, 5,500 r.p.m. Offered in bench and floor models with slotted, or oil trough machine-shop-type table; two and four spindles for bench mounting. Foot feed and high speed tapping attachments available. Boice Crane Co., 1730 Norwood Ave., Toledo, Ohio.

Switch

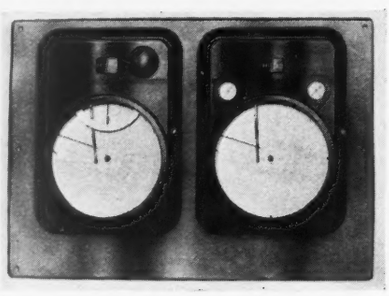
Heavy-duty master switch, Type SM, for mill and crane controllers, is actuated by a cam-opened spring-closed arrangement which eliminates the possibility of contacts remaining closed on a point where they should be open. The switch may be foot- or hand-operated. Has weather-proof construction by virtue of cast iron base and cover with wide flanges. Shallow base and deep cover provide accessibility for wiring. Double-break silver contacts of the bridging type. Westinghouse Electric & Mfg. Co., East Pittsburgh.

Steel Benches

Top of "extra heavy" steel bench is a ⅜-in. steel plate bolted to heavy-duty bench legs. Made in two standard widths: 24 and 30 in. Bench lengths: 3, 4, 5 and 6 ft. The 6-ft. length is equipped with three legs for added support. Accessories such as back plates, stringers, and shelves are made of heavy material. Benches can be equipped with steel drawers. Pollard Bros. Mfg. Co., 5502 Northwest Highway, Chicago.

Flow Controller

Flow ratio controller automatically controls flow of one fluid in definite ratio to the flow of a second fluid, by a turn of a



HE SLINGS SHOES AT THE NEIGHBORHOOD CATS

But He Has to Work Where Steel Wheels Screech All Day!

Crash! Clang! Bang! Noisy Trucks Sap Workers' Energy . . . Blast Profits

After a day in a noisy factory most men reach the end of their patience. At home, they demand quiet—and fight to get it.

But they can't fight the noise at work. It saps their energy, strains their nerves. Cuts their production by as much as 30%, according to recent laboratory tests.

You can't stop all the noise in your plant. But you can silence the clanging, banging, screeching of steel-wheeled trucks and trailers. Rubber is quiet. Goodrich Vulc-On Rubber-Tired Wheels on all your inside hauling equipment will reduce the noise level amazingly.

It's a difference your men will notice—and appreciate. Check closely and you'll find them turning out more work, better work. In less time, too!

They Pay Their Way

Now consider these other savings. Silent Goodrich rubber-tired wheels do not damage floors. They cushion loads—reduce breakage. They permit faster handling of materials—speed up plant operations. Less power is required to start and keep trucks moving. There is less depreciation of equipment—less maintenance.

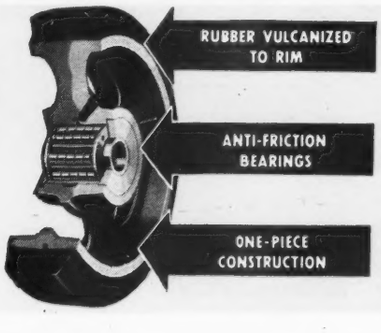
Built for service, Goodrich Vulc-On Wheels are of one-piece construction with no bolts or nuts to loosen and get lost. The wheel itself is corrosion-proof with anti-friction roller bearings to assure smooth operation. The tire is permanently vulcanized to the rim!

Start Saving—Now!

A Goodrich engineer will survey your inside hauling equipment, estimate costs—show you on paper how much you should save with Goodrich Vulc-On Wheels. There's no obligation. Just phone your Goodrich dealer or Goodrich Silvertown Store or mail the coupon below.

Goodrich *Industrial* Tires

THIS GOODRICH VULC-ON WHEEL *Pays its own way!*



Dept. N-60

The B. F. Goodrich Co.
Akron, Ohio

Gentlemen: Please mail me (without obligation) your booklet on Goodrich Industrial Tires and information on how they pay for themselves.

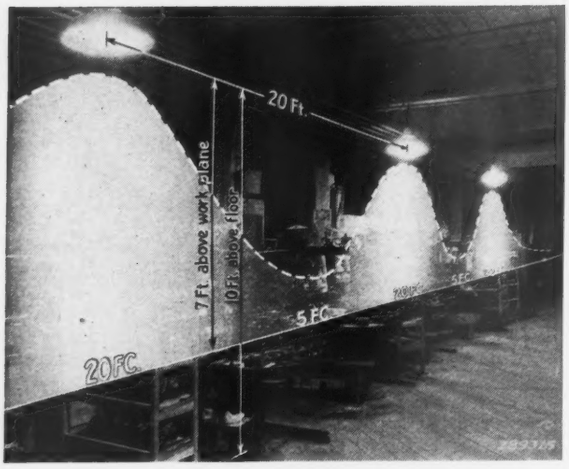
Name _____

Company _____

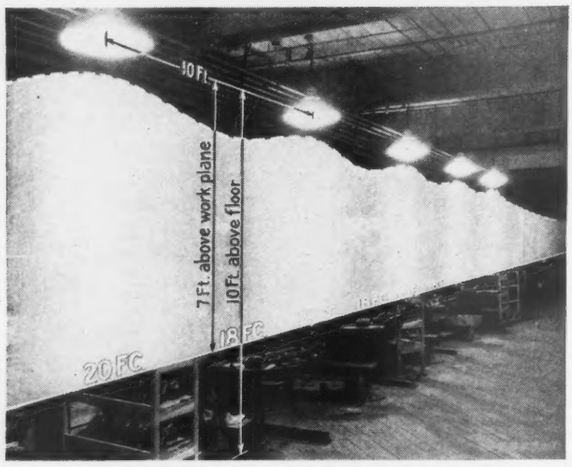
Street _____

City and State _____

HAVE YOU GOT ROLLER COASTER LIGHTING IN YOUR PLANT?



With lighting fixtures too far apart, poor distribution as shown in the top illustration, is the result. For best seeing conditions, the illumination in foot-candles throughout the work area should be reasonably uniform. Properly spacing the lighting fixtures, as shown below, results in greater uniformity.

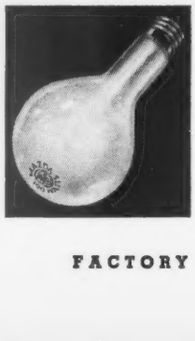


"ROLLER COASTER" lighting is poorly distributed or uneven lighting. When the amounts of light directly beneath a light source and midway between light sources vary greatly, you have a lighting curve that resembles a roller coaster with its sharp dips and climbs.

The extreme contrasts that exist between bright and dim areas may cause eyestrain . . . slow up production . . . increase operating errors . . . and constitute accident hazards. Seeing is difficult because workers' eyes are continually trying to adapt themselves to the many lighting conditions in the working area.

In general, direct lighting units should be spaced no further apart than their height above the floor. Where supplementary lighting is required, general lighting should also be used.

Write General Electric Co., Dept. 166-F-E, Nela Park, Cleveland, O., for the new booklet, "Lighting for Production in the Factory."



GENERAL ELECTRIC

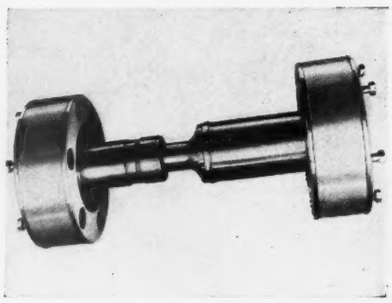
MAZDA LAMPS

They stay brighter longer

knob on outside of case. Applicable where ratio between flow of air and fuel gas, natural and artificial gas, between lean oil and wet gas entering an absorber, and between two different kinds of gases in a furnace, is to be changed. The controller consists of two instruments—a standard flow recorder and flow recorder controller. Rate of flow is measured and recorded by one instrument, control point is set on the other, which then records and controls the flow proportionately to the ratio set. The Bristol Co., Waterbury, Conn.

Drive Shaft

"Morflex" radial coupling drive shaft combines the features of the radial coupling in a slip-joint drive shaft for use as a



remote drive. Rubber bushings of coupling provide a flexing medium for withstanding shock loads and resisting vibration. Metal on metal movement is eliminated; coupling is insulated against noise and electricity and needs no lubrication. The slip joint is full spline construction, grease tight. Shaft members are machined from steel forgings, piloted into coupling hub members, and welded. The unit is adapted for use on dynamometer drives and other installations where end-wise shaft float may be encountered. Two types: Long coupled—tubing added to suit requirements; short coupled—one length. Both are made in various sizes with capacity ratings 2-27 hp. per 100 r.p.m. Morse Chain Co., Detroit.

Cylinder Trucks

Cylinder trucks for handling oxygen and acetylene cylinders and welding units, are equipped with two pneumatic tires mounted on roller bearing wheels. When the truck is in vertical position for loading, the tires do not touch the floor. Frame is all-welded construction; handles are of 1¼-in. tubing; cross-members are channel iron; individual chain with drawbolt is furnished for each cylinder. Dimensions: length of handles, 61 in.; overall width, 24 in.; platform, 12x24 in. Moellenbrock & Wilke, Washington, Mo.

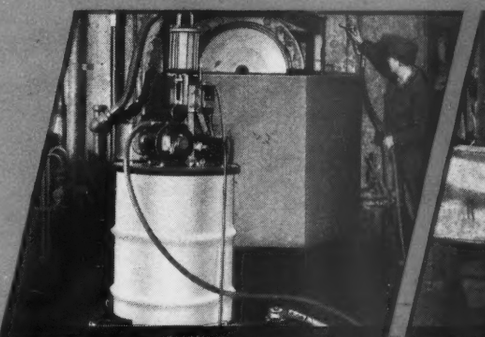
Heating and Ventilating Units

Type B L air-insulated electric heating and ventilating units for crane cabs, mill pulpits, operating stands, and isolated offices heat and circulate the air in winter, and circulate it in summer for ventilation and cooling. Adapted for filter attachment, a duct can be connected from blower inlet to a source of fresh air. Air from heater outlet can be directed to any desired point. Designed for flexibility in air volume and wattage rating, constructed with protective equipment against overheating, short cir-

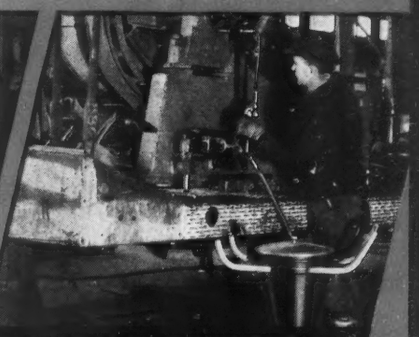
SPEED, CLEANLINESS, SAFETY, ECONOMY THESE ARE *Reasons Why-*

SO MANY INDUSTRIES DEPEND ON ALEMITE!

REG. U. S. PAT. OFF.



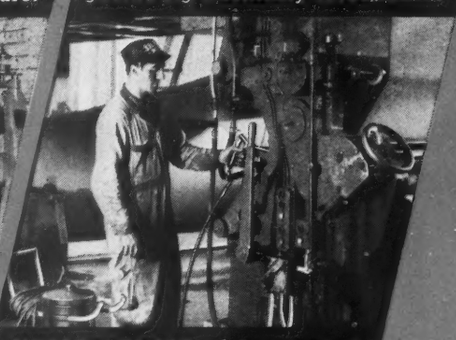
IN STEEL MILLS this Alemite Electric Gun makes history, providing volume delivery at high pressure.



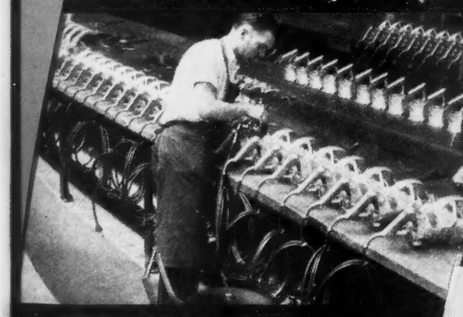
FOR HEAVY MACHINERY Alemite high pressure lubrication safeguards big machinery investments.

IN FOUNDRIES speed is all-important. Molten metal doesn't wait. Here the Alemite Air Rock Crusher speeds lubrication.

IN CANNERIES cleanliness must rule! Alemite Equipment puts grease into bearings, keeps it from food.



IN PAPER MILLS one bearing failure may tie up a block-long machine. Most mills use Alemite.



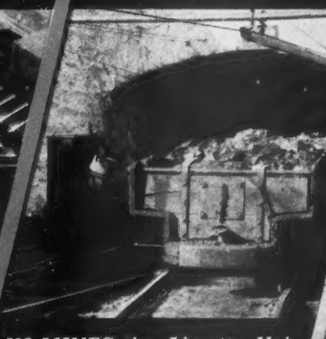
ON ASSEMBLY LINES rapid automatic dispensing of lubricant accelerates production. It's easy with an Alemite Power Gun.

IN TEXTILE MILLS Alemite lubrication avoids contamination of products, saves time, reduces bearing failures.

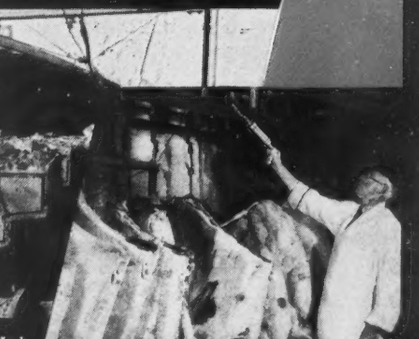
ON CONSTRUCTION JOBS the Alemite Portable Service Station provides power lubrication on the job; saves important time.

ON STAMPING PRESSES, bearings carry terrific loads. Alemite Power Guns do a thorough job.

ON CONVEYORS of all kinds, dependable Alemite lubrication helps prevent breakdowns, production delays.



IN MINES the Alemite Volume Gun can easily service several outlets at once.



IN PACKING PLANTS the cleanliness of Alemite lubrication prevents contamination, avoids waste.

ALEMITE REG. U. S. PAT. OFF.

A Division of Stewart-Warner Corporation, 1870 Diversey Parkway, Chicago, Ill.

Stewart-Warner-Alemite Corporation of Canada, Ltd., Belleville, Ontario

WORLD'S LARGEST MANUFACTURER OF LUBRICATION PRODUCTS

AN EXCLUSIVE YALE SAFETY STORY

Before buying your next chain hoist, give an EXTRA thought to safety—then buy Yale. For Yale features safety advances that can be found on no other hoist.

The EXCLUSIVE Safety Hook for example. Drop forged of special steel, this unique hook gives visible warning when overloaded, opening slowly—without fracture—before any other part of the hoist is strained. Guaranteed to stand up to 150% of its rated capacity without changing dimensions, the Yale hook is a safety valve that cannot fail!

In addition, mechanical perfection is guaranteed by swivelling the hook on heavy duty, totally enclosed ball bearings—and swinging it fore and aft on a cross head. This provides free, easy, and UNIVERSAL movement at any angle.

Only a Yale distributor can supply the Yale Safety Hook. Contact him for free catalogue which gives a full description of the Yale line.

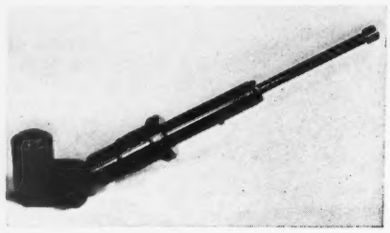
Capacities:
300 lbs.—40 tons

YALE
THE YALE & TOWNE MFG. CO.
PHILADELPHIA DIVISION, PHILADELPHIA, PA., U. S. A.
IN CANADA: ST. CATHARINES, ONT.

cuits, and motor failure. Available in three models. The Lintern Corp., Lorraine Ave., Cleveland.

Jack

Lightweight hydraulic jack weighs 46 lb.



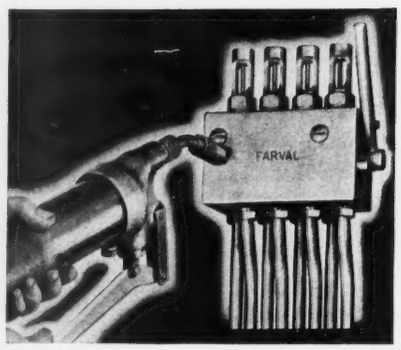
and has a 50-ton capacity. Small and compact—overall height 6 in., lift of 2¾ in.—it is for use in hard-to-get-at places such as in the repair of cranes and locomotives, for moving heavy machinery. Minimum space required for lifting cylinder is 5x6½ in., maximum length 2 ft. 8 in. Flexible joint between lifting cylinder and two pressure cylinders gives the tool a wide range of uses. Rochester Machine Co., 152 Virginia Ave., Rochester, Pa.

Reflector

Junction box on top of fluorescent lighting reflector allows fixture to be mounted and wired without disassembling. It has large wireway opening at the side. A cover plate concealing the wireway opening gives electrical rating and identification. The box may be connected directly to the conduit and the reflector may then be attached without rotation. Suspension by wires or chains is also possible. Available in single, double, and triple models for fluorescent tubing, concentrating and flood types. The Miller Co., Meriden, Conn.

Lubricator

Unit for lubricating small machines or a few bearings on larger machines, from a



single grease inlet, consists of a multiple measuring valve block with a single inlet port and 2-8 lubricant outlets per block. A number of valve blocks can be installed and connected in series when desired. Amount of lubricant to be delivered to any pair of outlets is individually adjustable. Movement of indicator stem attached to each valve piston shows when the bearing is lubricated to measured amount. Conventional hand or power grease gun is connected to the grease nipple at the inlet port. The Farval Corp., 3249 East 80th St., Cleveland.

"We Can Install COMBINATION STARTERS at a Considerable Saving"

National Automotive Fibres Inc.

Detroit Division
19925 HOOVER AVE.
DETROIT, MICHIGAN

PINGREE 1900

OFFICES
OAKLAND, CAL.
DETROIT, MICH.
LOS ANGELES, CAL.
LITTLE FALLS, N.Y.
COHOES, N.Y.

J. R. MILLAR
PRESIDENT

March 14, 1939

Mr. M. C. Ross
General Electric Company
700 Antoinette Avenue
Detroit, Michigan

Dear Mr. Ross:

You may be interested to know that as a result of our experience with your combination magnetic switches in our Detroit plant, we are standardizing on this type of motor starter exclusively in the new plant we recently completed in Los Angeles.

We have found that we can install these combination starters at a considerable saving as compared with the cost of installing separate devices. In addition to the saving involved, we like these starters because of the overload protection which they provide for our production lines and because of the safety they offer to our operators.

In all six of our plants we have endeavored to attain a maximum of efficiency and appearance, and have found your combination magnetic starters can be readily mounted individually or in banks to aid the desired results.

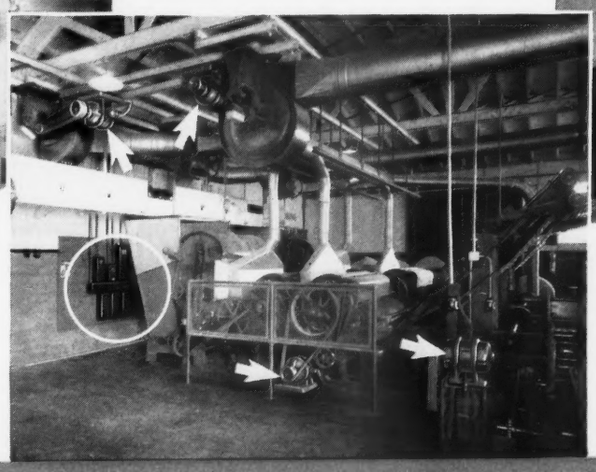
Very truly yours,
NATIONAL AUTOMOTIVE FIBRES, INC.

H. M. Ratley

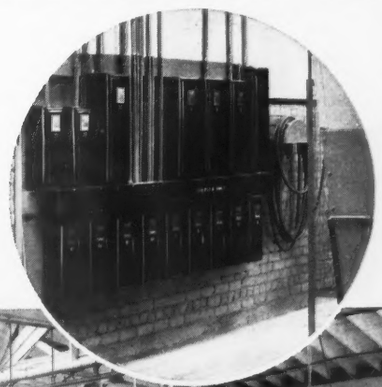
HMR:mat

Blackstone Studios, 20 West 57th St., N.Y.

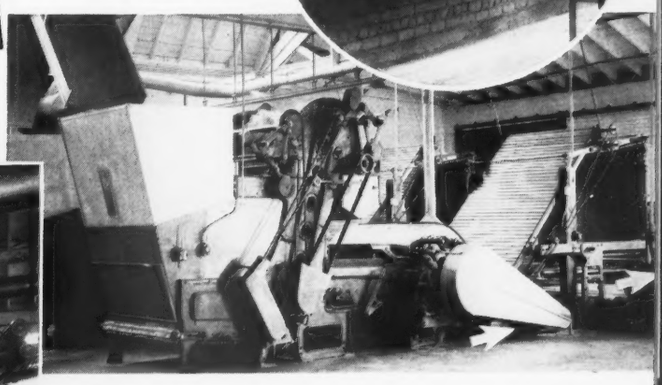
Mr. H. M. Ratley is engineer in charge of production equipment for NATIONAL AUTOMOTIVE FIBRES, INC., in Detroit and at all of its several plants. We asked him to tell us exactly why his company chose G-E combination switches for control of all motors in its new Los Angeles plant (shown above). Here is his answer:



▲Group of combination switches for controlling two Garnett machines. These switches make possible attractive installations by eliminating the need for many separate devices



Savings in installation are possible because the combination switch provides a manual disconnect with short-circuit protection, and a magnetic starter, in a single unit, wired and ready to install. Many other plants in the automotive industry also make savings in this way



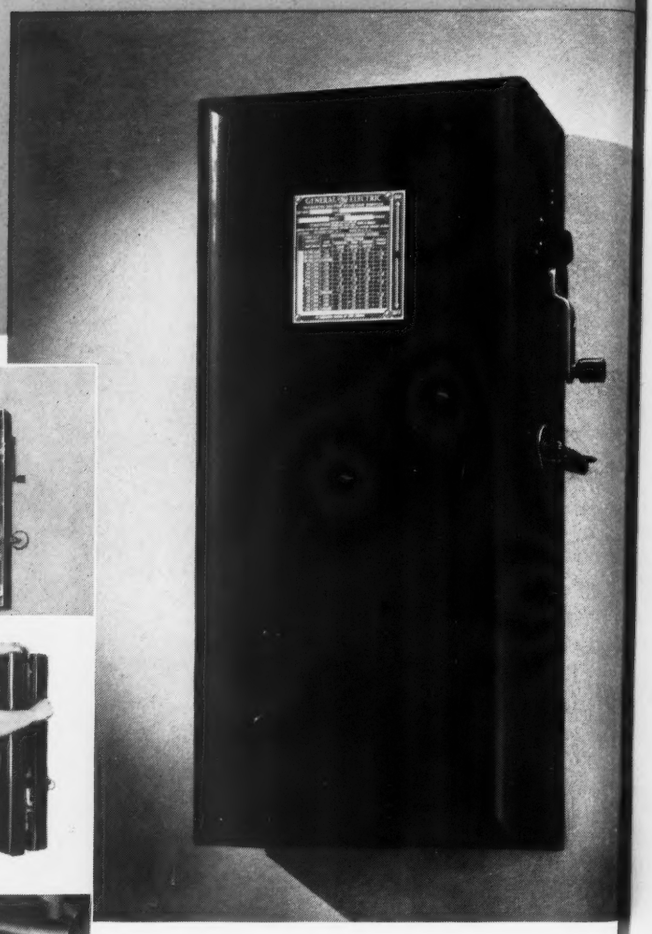
◀Garnett machine producing cotton padding for automobile upholstery. Overload protection is important to forestall injury to the machine in case of jamming of the cotton that is being processed. (Control shown at left)

▲Two Garnett machines in the new Los Angeles plant (controlled by combination switches shown above) make Sisal mattress pads. Convenient push buttons control the various motor drives

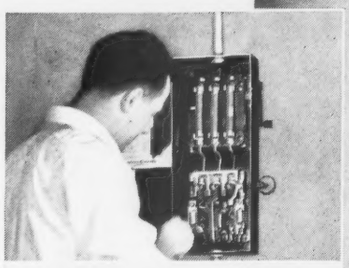
GENERAL ELECTRIC

You Profit Three Ways

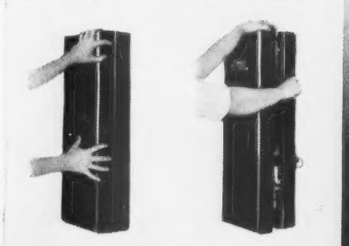
with the Complete CR7008 Motor Control



1. SAVE ON INSTALLATION — Having all the control required for a motor in a single case, wired ready to install, the installation crew simply mounts the CR7008 and connects the motor, push button, and power supply.



2. INCREASED SAFETY — Operators are protected from contact with live parts in the CR7008 because (1) the cover cannot be opened unless the manual switch is OPEN and power removed; (2) the manual switch cannot be closed to apply power as long as the cover remains open.



3. ATTRACTIVE APPEARANCE — The CR7008 enables you to have better looking installations. This single attractive case, replacing two or more separate controls with interconnecting wiring, makes possible wiring jobs that are neater in appearance.

CR7008 combination switch with manual disconnect switch, fuses, and magnetic motor starter

IF you've never used CR7008 combination switches, your first trial will make you wonder why you haven't. They embody the same high-quality mechanism that is employed in the popular CR7006 magnetic switch—including isothermic overload relays. But, in addition, they include a manual disconnect switch, and fuses (or manual circuit breaker if desired). You'll need these for a motor, anyway. This CR7008 provides them all in an attractive, ready-to-install combination.

General Electric Company, Dept. 6D-201
Schenectady, N. Y.

Please send me your new folder describing the CR7008 Combination switch. (GES-1618)

Name.....

Address.....

City.....*State*.....

080-188

GENERAL ELECTRIC

Wright Improved High Speed Hoists HANDLE YOUR JOBS RIGHT

Your jobs are handled right by the Wright Improved High Speed Hoist. That is because every one of these hoists, in any capacity, is built to meet practical operating conditions just as they come.

Zinc-coating prevents corrosion. A load chain safety guard makes it impossible for the load chain to ride out of the pocket, regardless of position. Fast, smooth, positive action is assured by precision load wheel bearings.

These features, and 18 others, mean that the Wright Improved High Speed Hoist performs faultlessly over a long service life—and that it provides safety and convenience every time it is used.

Send for the new Wright Catalog, which describes these hoists in capacities from ¼ to 40 tons, and in combination with various trolleys and cranes.

Order from your distributor

BUY ACCO QUALITY *in Wright Hoists, Tru-Lay Preformed Wire Rope, Reading-Pratt & Cady Valves, Campbell Abrasive Cutting Machines, American Chains, Page Welding Electrodes and Page Chain-Link Fence.*

WRIGHT MANUFACTURING DIVISION
YORK, PENNSYLVANIA
See our exhibit, Metals Building, New York World's Fair

AMERICAN CHAIN & CABLE COMPANY, Inc.

AMERICAN CHAIN DIVISION • AMERICAN CABLE DIVISION • ANDREW C. CAMPBELL DIVISION • FORD CHAIN BLOCK DIVISION • HAZARD WIRE ROPE DIVISION • HIGHLAND IRON AND STEEL DIVISION • MANLEY MANUFACTURING DIVISION • OWEN SILENT SPRING COMPANY, INC. • PAGE STEEL AND WIRE DIVISION • READING-PRATT & CADY DIVISION • READING STEEL CASTING DIVISION • WRIGHT MANUFACTURING DIVISION • IN CANADA: DOMINION CHAIN COMPANY, LTD. • IN ENGLAND: BRITISH WIRE PRODUCTS, LTD. • THE PARSONS CHAIN COMPANY, LTD. • *In Business for Your Safety*

When Others Take a Licking on Their Surplus Stock

(Continued from page 51)

partment should think—that it can sell, let us say, 50,000 of these units during the coming year. They want us to put 10,000 of them into production immediately. But the executive vice-president, who controls production authorizations, firmly says "No." He knows that the model may not look so good to the folks in the field and prefers to wait for field reaction, especially as the nature of radio selling makes it impractical to refer every single new model to the consumer in preliminary surveys. If it develops that the set has all the selling appeal we had hoped for and the customers are clamoring for it, then of course he is in the sales department's "doghouse" until production finally catches up with demand.

After this first shipment of a new model, we ask distributors to estimate their needs and place their orders a month ahead of the shipping date. That is, if our convention is in May, we request early receipt of orders for July manufacture and shipment. We want August shipments ordered not later than July 1. And so on, month after month. But we do not hesitate to cut a distributor's order if we think he is being too hopeful. He may cuss us at the moment, but three or four months later he will bless our discretion—he may even raise his gratitude to the point where he will tell us so.

After the distributors have been stocked, we require weekly listings of their inventories, by stock numbers. This information is utilized in preparing our numerical tabulations. It also becomes the basis for a presentation showing shipments, production, and factory orders placed for the period. With the graphs, it is unnecessary to look at the tabulations to obtain the over-all picture. If the graphic lines fail to amble along in step with one another, allowing for seasonal trends, we get the danger signal and start looking for the trouble in time to correct it.

In purchasing, this means we order from our suppliers only those materials and parts we know we shall need. If cabinets are hard to get, we may be daring enough to give the maker an advance order for half of the estimated requirements of the month.

When labor troubles threatened a couple of years ago in so many parts makers' shops, we actually built up reserve stocks for a month or two ahead. And if we are offered a particularly low price to accept a huge shipment of some standard item not subject to obsolescence or deterioration, such as nuts or bolts or wood screws, we might even take a year's requirements at once. But this is as far as we shall ever go. Our general rule, subject only to occasional and very discreet exception is: "Order exactly what we have orders for, and nothing over."

When the sales department secures its orders from distributors, these come to the executive vice-president's desk along with all the statistical information on stocks everywhere between the factory and the retail stores. He discusses the matter with the sales manager and the factory superintendent, then approves production orders according to his decision. His decision is based on the answers to two questions. How many orders have we from distributors? How many of these orders should be filled from other distributors' stocks, considering the seasonal trend? If there are no excess stocks requiring cross-shipment, and the orders will merely maintain distributors' stocks at the required level, then he puts into the hands of the production executive manufacturing orders for exactly the number of sets that distributors have ordered.

Toward the end of the season, care-

Uniform Results . . . Lower Costs with Ryerson Certified Alloys

You can reduce failures—eliminate spoilage and get better results in less time with Ryerson Certified Alloy Steels. They are from selected heats of steel that meet an ideal specification—a "specification within a specification"—that assures uniform response to heat treatment.

All Ryerson Certified Alloys are analyzed and tested in advance. Special data sheets showing exact chemical analysis, grain size, cleanliness rating, and results of actual heat treatment tests, are prepared and sent with every shipment. You know exactly what you are getting. Your heat treater does not have to test. He takes no chances. Spoilage is eliminated and sound dependable jobs of high accuracy and uniformity are secured.

Ryerson has large and complete stocks of these selected identified alloy steels. They cost no more and quick shipment is assured.

Ryerson Certified Steels also include carbon, tool and stainless steels that meet definite quality standards. They offer many advantages to steel users. Let us tell you the complete story. Write for booklet.

Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON CERTIFIED STEELS

RYERSON

ATTENTION, ALL BELT USERS!

Only ONE cord belt has this patented BALANCED construction that insures a true-running belt

BALANCED BODY made of heavy rope-cord spiralled continuously without a splice. Cord on opposing sides of belt axis is twisted in opposite directions to neutralize torque of cord.
BALANCED COVER laid parallel to axis of belt — made of fabric in which alternate warp threads are twisted in opposite directions to prevent side-creep.
RIGHT-HAND TWIST
LEFT-HAND TWIST
GOODYEAR COMPASS CORD BELT
balanced construction fully covered by U. S. and foreign patents

THE truly sensational success of the Goodyear COMPASS Cord transmission belt in solving industry's most difficult belting problems has led to many imitations seeking to capitalize on the magic word "cord."

But what makes the Goodyear COMPASS the truest-running, most nearly stretchless belt on the market—what gives it such exceptionally high flex-life and long wear—is a fully patented method of cord construction no other belt manufacturer can employ!

The Goodyear COMPASS Cord is a modernized flat belt version of the ancient rope drive. With rope drives, as you know, it is necessary to use grooved pulleys to keep the ropes from running off due to their torque or twisting action.

In the COMPASS this torque is balanced by twisting the ropes, or cords, on opposing sides of the belt axis in opposite directions. Alternate warp threads in the fabric cover are similarly twisted. This patented construction in both body and cover neutralizes any tendency to run off the pulley with an equal pull toward the opposite side, insuring a belt that runs true.

More than this, it permits Goodyear to use larger, stronger cord, eliminating fabric plies entirely in the carcass, and making a thinner, stronger belt with far higher flex-life and longer service-life.

The best proof of this is the remarkable performance of COMPASS belts on industry's hardest drives. From two to five times longer life with practically no stretch is typical. So don't be deceived by the word "cord." The Goodyear COMPASS Cord belt is the only belt in the world with patented balanced cord construction that insures true-running, high flex-life, low stretch and maximum wear. To test COMPASS superiority for yourself, call the nearest Goodyear Mechanical Rubber Goods Distributor.

BELTS
MOLDED GOODS
HOSE
PACKING
Made by the makers of Goodyear Tires

THE GREATEST NAME IN RUBBER

GOODYEAR

ful judgment based on experience must be exercised to permit tapering off production to meet all real needs. Our rule is to play it ultra-safe, so that there actually develops every year a shortage of Zenith sets at the end of the season. Distributors are busily cross-shipping then, trading off one model for another as their requirements dictate.

This practice is also common among dealers when they have orders to fill and are unable to procure them from the distributors. Undoubtedly we lose some slight sales volume at this time of year, generally to the other lines carried by our dealers. We do not object. We'd rather miss skimming the last one-half of one per cent of the cream than lose 75 per cent by being hoggish. And our distributors and dealers on the whole agree that the policy is wise and sane and therefore best for them, even though it hurts them to lose business for lack of stock when business is normally slack.

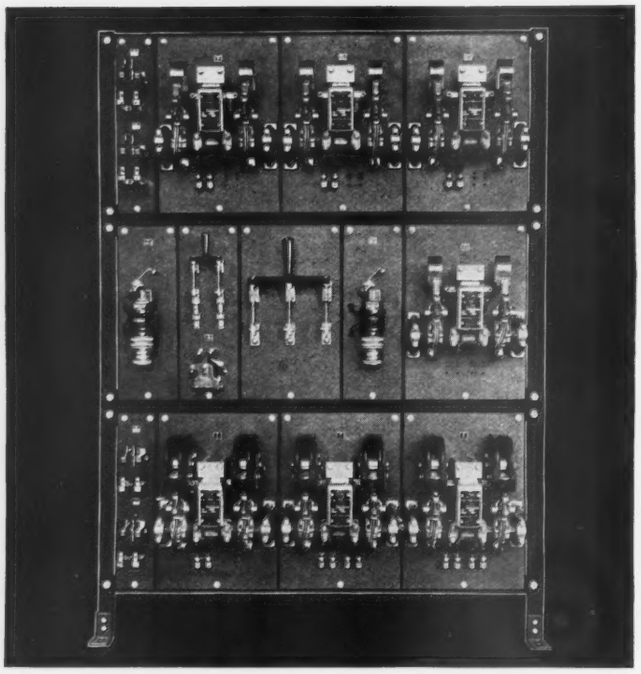
Just as we are working toward elimination of sales curves in our operations, so too, we are striving for a leveling of employment curves. Because we thus avoid gambling on future demand at any time during the year, we are able to employ our production equipment and our factory people much more efficiently and more satisfactorily.

At the start of the season we assure our employees a full work week. When the first rush demands have been met, we may at times cut this to 32 hours. Then as autumn demand becomes brisk we step up employment to full time. During a brief period, while we may be changing models and may have few orders, we stagger employment.

Although this falls short of perfection, it is generally regarded in our industry as a remarkable achievement in so seasonal a line of business. Our people appreciate it; they recognize it so heartily that we believe our personnel morale is exceptionally high. We are constantly working on plans to level the waves of our production.

This, then, is why we feel that inventory control is no mere matter of factory interest. It is important to every activity of a manufacturing company. And if, as we are frequently told, it is far more difficult in the radio industry than in most lines, there seems no good reason why the same approach to the problem should not prove equally profitable to other manufacturers in entirely different lines.

REVERSING AND NON-REVERSING, PLUGGING CONTROL FOR A.C. WOUND ROTOR MOTORS



EC&M Frequency Relay Magnetic Control provides a new, efficient method of controlling A.C. Wound Rotor Motors used on Cranes, Table Drives, Transfers, Coke Pushers, Shears, Wire-Drawing Machinery, etc. The important fact is that this control exactly matches the requirement for maintaining the carefully pre-selected values of torque for bringing the load up to speed. Smooth, efficient acceleration is thus obtained by accurate control of motor torque throughout the entire starting period. Send for further information.

THE ELECTRIC CONTROLLER & MFG. CO. CLEVELAND, OHIO

HEAVY DUTY MOTOR CONTROL FOR CRANES, MILL DRIVES AND MACHINERY • BRAKES • LIMIT STOPS • LIFTING MAGNETS AND AUTOMATIC WELD TIMERS

THE ELECTRIC CONTROLLER & MFG. CO.
2688-F East 79th St., CLEVELAND, OHIO

Gentlemen:
Please send me further information on the New EC&M Frequency Relay Magnetic Control for a .... HP .... Volt .... phase .... cycle Wound Rotor Motor.

Name.....

Company.....

Address.....

Untouched by Human Hands

(Continued from page 49)

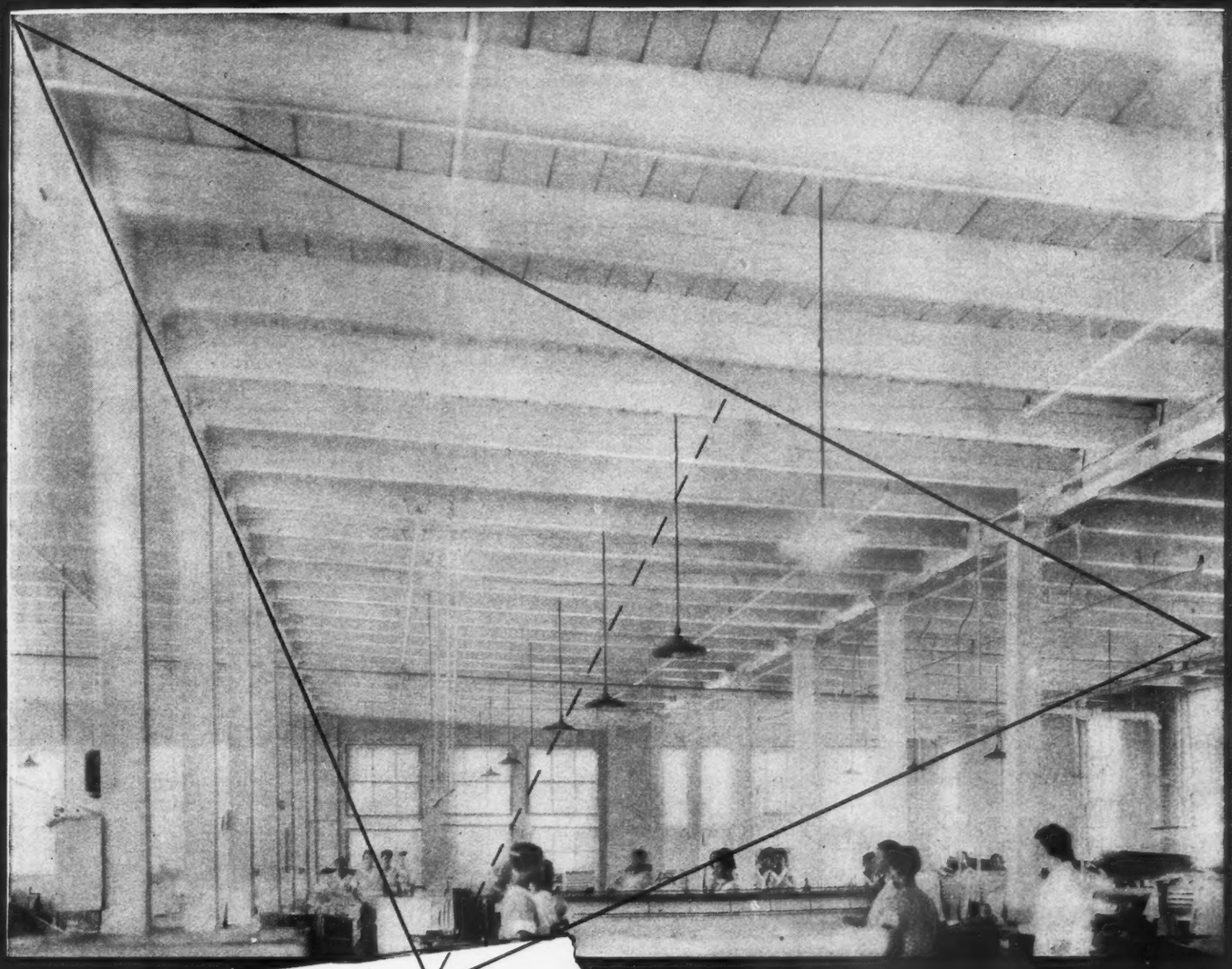
the sheet in his "book," which is the rack in which it rests with other sheets while going through the kiln; the only man handling in the entire process consists of his guiding the sheet into the book. About ten seconds after pressing the button for a sheet, he is ready to press it again for another sheet.

The main, or upper, delivery belt is for the full sheets of veneer, as described in the preceding paragraph. There are two other belts leaving from the same station at the take-off end of the peeling lathe. One carries the refuse to the hog for cutting up into fuel. The other is a belt delivery, running just under the main delivery belt, for salvaging yieldable trim, those portions of the peelings that are not continuous, but which contain some usable sections; these are carried to a station where they are trimmed up by hand.

The operator in charge of the peeling lathe has control buttons to regulate the conveyors. When first a new log goes into the lathe, he sends the trimmings to the hog. As soon as he sees some yieldable trim coming, he switches over to that belt. Then, when the veneer begins to come continuous, he switches over to the main delivery belt.

Something very new, and exceptionally effective, is the kiln at the new Meyercord veneer mill. This kiln has

HERE'S AN AXIOM FOR YOU:



whiter paint = more light
more light = better sight
better sight = quicker work
quicker work = lower production costs

∴ whiter paint = lower production costs

Q.E.D.

There's no getting around it—the whiter the paint, the more it reflects light, the harder it puts your plant ceilings and walls to work for you!

So—when you buy white paint, make it Sherwin-Williams Save-Lite. Long noted for its lasting whiteness, this leading industrial paint is now made actually whiter...still greater in light reflecting power.

Call in the Sherwin-Williams painting technician. Have him inspect your plant. Let him specify the exact type of Save-Lite best fitted to meet your plant's every painting condition. There'll be no obligation. Or write for the free Sherwin-Williams "Plant Conditioning Report." Address The Sherwin-Williams Company, Cleveland, Ohio and all principal cities.

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THE LIGHT CONDITIONING PAINT

four chambers, and might be termed of progressive-stage design. The newly peeled, wet veneer in books comes into the fourth chamber, then at intervals is moved up a chamber at a time until it emerges fully dried.

The kiln design utilizes the varying degrees of heat and moisture in the air to perform the sequential drying jobs to which each is best fitted. The air in the fourth chamber, where it meets the wet veneer, is comparatively cool by its contact with three preceding chambers filled with drier veneer, and it is almost completely saturated. As this moist air strikes the cold veneer, the warm moisture condenses on the surfaces of the veneer, and then—the veneer is on edge—it runs down the face and drips off into the floor drainage. The result is that the surface salts and acids drip off, washed off by this condensation, and leave the veneer freed of the greater share of these elements which tend to make wood brittle. Likewise, this process permits the cold, wet veneer to warm up comparatively slowly, with consequent benefit to the texture of the wood. It is only after this drip-washing process and the warm-up are completed that the books are moved from this chamber to the next, which is hotter and dryer.

The kiln is designed to exhaust 10 per cent of the total air per minute. The exhaust is entirely from the fourth chamber. The other 90 per cent is recirculated along with 10 per cent of new, dry, hot air, regulated by instrument controls for temperature and humidity. The circulation is such that this 90–10 mixture enters the first chamber, where the veneer is getting its final drying. From here it is drawn down through an onion-shaped duct beneath the floor, circulated through the second chamber of the kiln, which is slightly cooler and moister in consequence of the work the air has previously performed. From here it is drawn down through the same sort of floor duct into the third chamber, then again into the fourth chamber, where 10 per cent is exhausted and the balance drawn to the first chamber once more.

The result of this progressive drying is that the veneer's temperature steps up only a few degrees at a time, as it moves from one chamber to the next. The consequence is a more gradual loss of moisture, with less distortion of the wood fibers; this greatly reduces the tendency to warping and checking. The benefits are visible in comparing this 8-ft.-wide veneer with narrower sheets made by the older process. There is less wave and less checking in the 8-ft. sheets than is to be found in an ordinary 3-ft. sheet.

A Dollar on Safety Pays Four

(Continued from page 63)

safeguarding of machines and of the workplace itself, making it physically a safe place in which to work. Of what value can all the flag-waving, the safety contests, and the speech-making of plant executives be if the employee can look about him and see a broken railing on some stairway, an unguarded well in the floor, flying belts unguarded, and if he already, perhaps, bears a scar on his finger where his machine has nipped him? Management must do its part by spending necessary money if it expects to save money by the prevention of accidents.

It is true that the bulk of the safety job is one of education. Various estimates have been made that from 50 to 75 per cent of all the accidents could be prevented if employees were instructed in safe practices and if they followed those safe practices assiduously. This is just another way of saying that supervision is largely responsible for accidents; and of course this leads right up to the door of management.

It is impossible for me to discuss

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WESTINGHOUSE ELECTRIC

the big subject of safety education. It embraces proper placement of men, job training, supervision, discipline, general safety education, and certain personnel activities. I will illustrate just one phase of it by retelling two incidents that probably are not at all new to you.

One occurred in a plant in the automotive field, not a large plant, but its accident record was so bad that the insurance companies finally notified the management that unless they got a real safety program under way and backed it up, there would be no more insurance available. Which explains why the management, with its soul in the production job rather than callously uninterested in safety, hired an alert young fellow with only a moderate amount of safety experience in a large plant, and turned him loose to see what he could do.

It happened that what the young fellow *did* know about accident prevention really had been absorbed; he was interested in safety and determined to make good in his job. He delved into the accident records of the company, but all he found was a record of so many claims on the insurance company, and that the insurance company had paid out so many thousands of dollars in the past year. So he went out to the foreman of the first department he came across and asked him: "How did you happen to have so many accidents last year?"

"What!" exclaimed the foreman. "Say, I didn't have any accidents. It was Bill Jones, over in Department 2, who had a lot of accidents. You see Jones."

So the safety man went to Bill Jones and repeated his request. "Not me," denied Jones. "We haven't had an accident in this department for years. But Jim Brown, over in Department 3, had plenty. He can tell you about accidents."

When the safety man had made the rounds of the departments and found not a single foreman who would admit having a bad accident record, he went back to the insurance files and reconstructed a list as well as he could. Then he called a meeting of the foremen and went down the list.

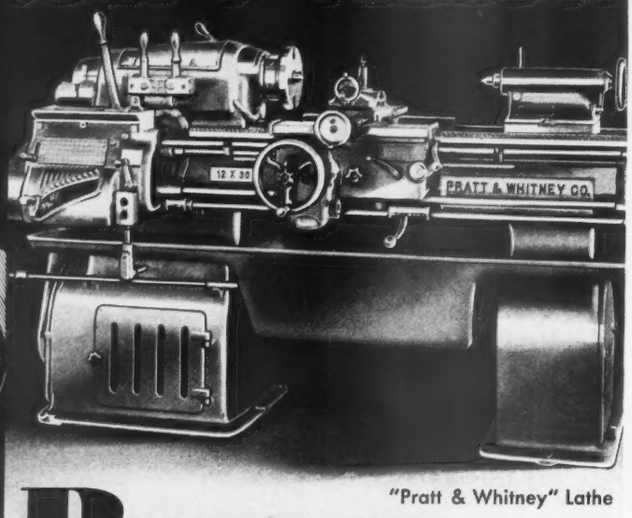
"Smith, you had so many accidents costing so many hundreds of dollars in your department last year. Jones, your record was as follows. Brown, here's what you did. Now, then, do you want to help the company cut down the losses in men and money caused by these accidents, or don't you mind being responsible for them?

"All right, then. Here's a list of the men injured in each department of our plant last year. I'll give each foreman his own list. Will you fellows take these lists, study them, and try to remember just how those accidents happened? I'll be around as soon as I can get to you; I want to be of help, if I can, in stopping this sort of thing. But you know the hazards of the jobs in your departments better than I do; if you study them, you can do a lot toward stopping accidents like those we have been having. Let's all get busy right away."

The plant continued to drive for production; and presently, besides showing a startling reduction in the injury rates, the safety man was able to point out to the managing executive a substantial increase in output, which undoubtedly was one of the indirect savings. With this showing, management was strongly behind him in his safety work, and within a couple of years he was definitely able to show several hundred per cent net profit to the company on the cost of the safety department.

The finest type of safety work is tied in closely with engineering. The shipping department of a certain plant had many accidents and most of them took place on the truck dock or the freight platform. So the safety man went there to see what could be done. He found the foreman eager to help,

YOU *Must* CONSIDER TODAY'S TRENDS!



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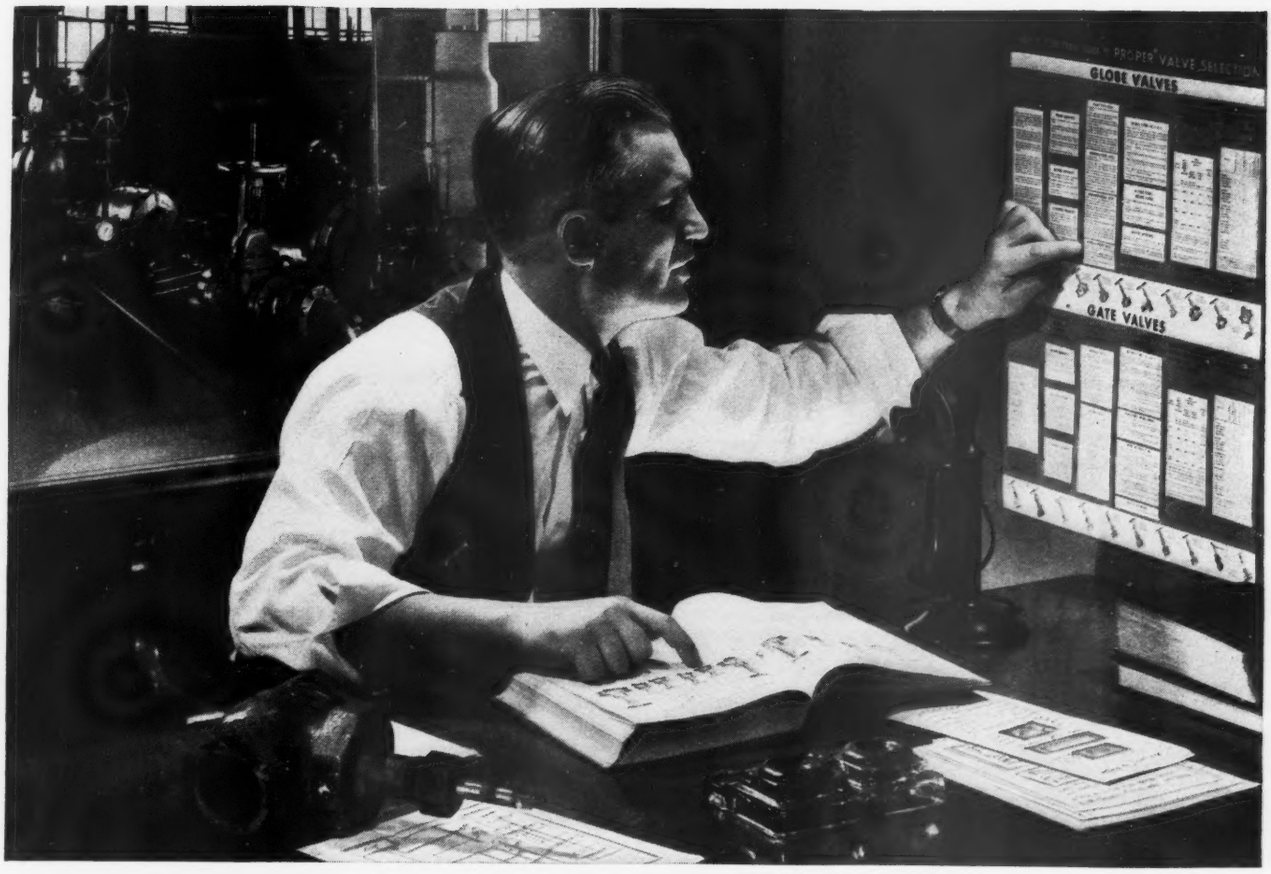

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Mismatching of valves and requirements can be avoided. Let Crane's bulletin, "Service Characteristics of Globe Valves and Gate Valves," with its Valve Selection Guide, help you eliminate this hazard in your plant. This guide tells you how well each of the basic valve designs, globe and gate, and their many combinations of disc, bonnet, and stem types, are fitted to service conditions. Such information combined with *your* knowledge of *your* requirements, leads you to the ideal valve for each installation.

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for the management had had him in the doghouse for months. However, he had no explanation of the accidents—they were too much for his mentality to cope with. The safety man and the foreman stood around watching the men for quite a while. Finally the safety man said:

"Bill, I notice your men are using a lot of different methods of getting a load off of a hand truck and into the body of a motor truck or trailer. What is the best way to do it anyhow?"

"Why—I don't know," admitted Bill. "Back in my days of hustling freight, we never loaded into anything but box cars, and they were level with the platform."

"How about calling some of these loaders over here and asking them about it?" suggested the safety man.

"Okay," agreed the foreman, "but you ask them. You're the one who wants to know."

So the safety man asked the workman nearest him: "How do you put a case up on the floor of a motor truck?" The workman showed him. "Is that the best way?" he persisted.

The loader thought it was.

"How about it?" the safety man asked the other loaders.

"No, that way's hard on your back, and you're liable to drop it on your foot," objected one man. "Here's how I do it."

The little group continued talking and demonstrating until everybody had agreed on the best way. They spent considerable time, but when they had finished, they had developed a new method which all admitted had its advantages from both a convenience and a safety standpoint. "Now, Bill," the safety man requested the foreman, "you keep watching them and see that they do it that way."

Once that job had been simplified and made safe by the fundamentals of job training, the safety man was able to follow the same method in the rest of the department. Every major job was analyzed, the best way found, and the department standardized upon it. Eventually that shipping department was near the top of the list for both efficiency and safety, and the safety man's attention was concentrated elsewhere.

It is an axiom that the safe way is the best way from the standpoint both of efficiency and profit.

Where Every Move Is Mechanized

(Continued from page 56)

together with conveyors. At the end of the cellophane unit, the cartons are discharged onto a belt table, operators pack the wrapped individual cartons into manila containers. These containers are carried by the belt to the packers at the end of the table.

Display containers have been brought up on the dumbwaiter previously described. They are assembled and placed on a small belt conveyor which runs above the big belt table. Alongside the belt table stands a portable packing jack. On it the operator places the finished carton, releases a latch. This drops the carton down to the live roller conveyor below, which carries the filled carton to a sealing machine. This machine delivers the sealed carton to a spiral chute. The sealed carton is finished product, and is now destined for storage and eventual shipment.

Because of special problems involved in packaging the 10-cent size, one piece of equipment used is materially different from those on the other lines, and deserves special description. It might be flippantly described as a trick elevator which brings up the corrugated case full of empty cartons knocked down flat, leaves it on the platform of the elevator, takes down the empty case. The platform itself is of prong

P&H TRAV-LIFT CRANES

Where you repeat the process of handling materials in production, it is frequently possible to reduce costs substantially by using a P&H Trav-Lift Crane. Designed for moderate service, these low-cost installations are saving money in many types of work. Bulletin H-13 describes them; gives complete engineering data on all sizes and types from 1 to 15 tons capacity. Ask for your copy. Harnischfeger Corporation, 4525 W. National Avenue, Milwaukee, Wis.

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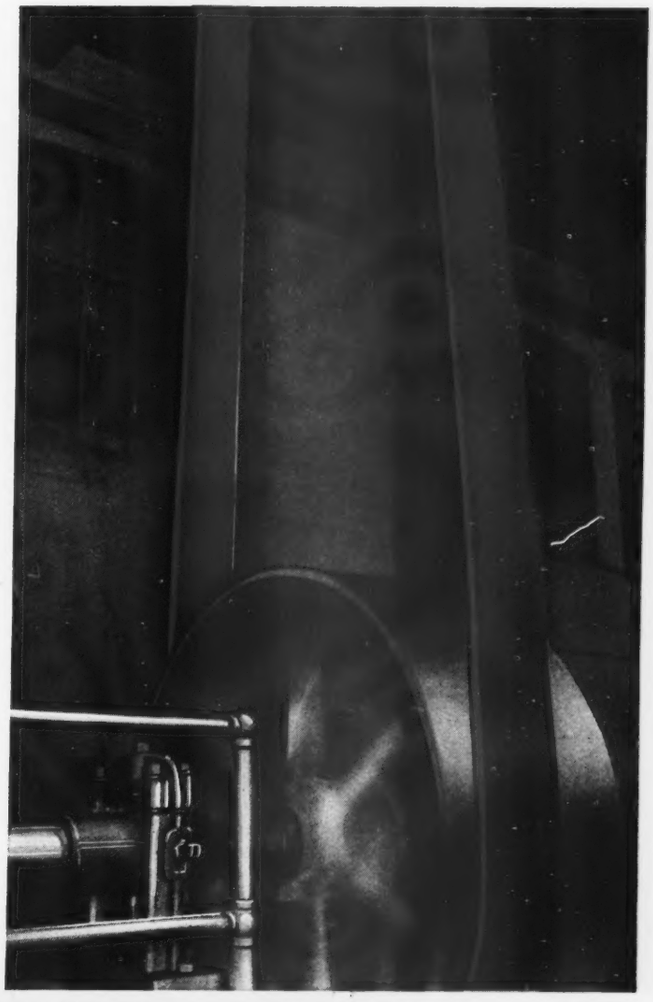
* LOWERS THE YEARLY BILL FOR BELTING

* KEEPS PRODUCTION UP .... COST DOWN

AS proof: in 1934, the 10-inch, 7-ply Condor Compensated Belt shown was installed in a large New England paper mill. According to last reports, it was still operating on a cone pulley Dryer Drive on the main line . . . and giving perfect service.

Condor Compensated is built for that sort of service on an exclusive and patented design which compensates each ply to its share of the load and materially reduces cost by increasing life and efficiency. By equalizing the stresses and strains developed when the belt flexes under tension around the pulley, ply rupture and separation are eliminated, fastener life is increased and operating and maintenance troubles are minimized. Condor Compensated has a special pulley-side surface to permit *low tension operation.*

As your first step to more efficient and economical power transmission, write for Bulletin 6808-C. It explains in detail the Compensated Construction which results in



*12 ADVANTAGES

1. Ruptures in outside ply eliminated.
2. Freedom from ply separation.
3. Longer fastener life.
4. Can be operated on smaller pulleys.
5. Less bearing, shafting and hanger troubles.
6. For heavy loads, plies may be increased with same pulleys.
7. Operation less affected by atmospheric conditions.
8. Higher overload capacity or margin of safety.
9. Less wear on pulley side.
10. Can be dressed without injury to belt.
11. High production efficiency.
12. Material reduction in belting costs.

Condor Compensated also available in type F where rubber friction pulley surface is desired, and Type B where some slip is necessary.

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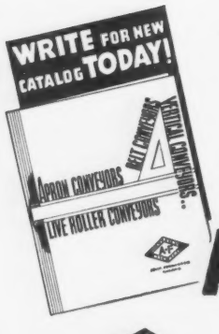


ALVEY-FERGUSON

CONVEYING MACHINERY

SCIENTIFICALLY PLANNED *Conveyors*

type, specially designed so that when the elevator goes down the empty case slides off on a take-off chute, and the bare platform goes down a few feet further to first-floor working level for loading with another carton filled with empty cartons.

To feed the booster, a short length of roller conveyor on the first floor holds several cases of empty cartons. Thus the stockroom man needs to fill it only once in a while, instead of tending it constantly. It is worth comment that every job of the sort on the first floor is possible of batch feeding, which permits the stockroom man to handle all of these on a single unhurried round, rather than tending continuously at one or two stations.

A full case from the storage conveyor automatically loads upon the booster carrier, strikes a limit switch, starts the booster up. A few feet from the bottom are discharge fingers, which are of no significance on the upbound trip; the rising carrier lifts these and continues to the top. At the second floor, it automatically stops. When the second-floor operator has fed all cartons into the line from the case, she pushes a button, the carrier starts downward carrying the empty case.

Fingers Catch the Empties

Remember, please, that the carrier platform is of prong design. It therefore passes through the discharge fingers, but these fingers catch the empty case. From the fingers, the case slides into a short chute just above the full-case feeder. It remains in this chute until the stockroom man comes along and removes the accumulated empty cases at the same time he refills the full-case feeder. And, of course, when the prong platform of the booster reaches the bottom of the shaft the cycle is repeated.

As has previously been mentioned, when the finished product stage has been reached, the filled and packaged bottles are in sealed shipping cases. They are discharged from the case sealing machines into spiral chutes at the end of the packing line and drop to the first floor. There are two such chutes; by using a deflector guard, the packages may be sent to a discharge slide at the bottom of each chute, if the goods are needed for immediate use. But the normal procedure is to send them to a live roller conveyor equipped with automatic spacers. The spacers are designed to handle four cases per minute from each chute, and stops release the cases from either side alternately.

A belt conveyor 250 feet long runs the length of the building and distributes finished cases wherever de-

Left—G-E 7 1/2-hp, 284-frame, standard induction motor.
Length—22 5/8 inches
Height—14 inches
Width —14 inches

Right—G-E 7 1/2-hp, 284-frame, single-reduction gear-motor.
Length—25 11/16 inches
Height—14 inches
Width —14 inches

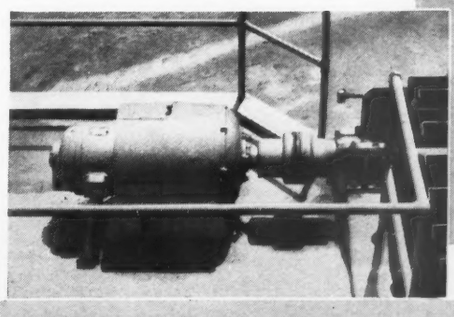
G-E GEAR-MOTORS SAVE SPACE ON LOW-SPEED APPLICATIONS

THE use of gear-motors to drive low-speed equipment, such as conveyors, pumps, agitators, mixers, and other machinery, has enabled many companies to save valuable space and thereby obtain greater, more efficient production in their plants.

Besides saving space, G-E gear-motors cut power costs because they have the high efficiency and favorable power-factor of a high-speed motor, because the helical-gear planetary-type of transmission prevents slippage, and because close motor and gear connection minimizes mechanical losses.

They require little maintenance over a period of many years. They are sturdily constructed, and the planetary type of transmission, through even distribution of gear-tooth pressure, makes possible smooth operation with little wearing of parts.

It will pay you to have a G-E motor specialist show you where your plant operations can be improved with gear-motors. For further information, call our nearest representative or write General Electric Company, Schenectady, N. Y.



G-E gear-motor driving conveyor at flotation plant of a Southern chemical company

Features of G-E Gear-motors

1. Standard ball-bearing motor—polyphase, single-phase, or direct-current—held in concentric alignment with gears by rabbet-fit assembly of gear casing on motor frame.
2. Helical-cut planet gears mesh with internal ring gear with the minimum of sliding or friction contact.
3. Motor shaft supported by its own bearings, independent of the gear assembly.
4. Planet cage is supported by its own bearings, widely spaced to give positive alignment and to provide for overhung loads.
5. Low-speed shaft of ample proportions—a steel forging integral with the head of the planet cage.
6. Center driving pinion integral with the motor shaft. All gears are of the helical type in order to provide continuous tooth contact. This contributes to high efficiency, long life, and smooth operation.
7. Oil-return groove adds to the effectiveness of the oil-circulation system.
8. Large oil well, provided with oil filler on top and a drain plug, affords ample splash lubrication.

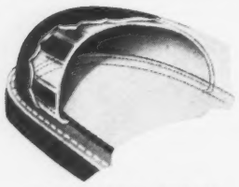
GENERAL ELECTRIC

020-384

"I HATE the Place Where Harry Works"

HARRY PAVLAC'S wife is sure he works in a dreadful place. Harry came home with a smashed foot... laid up for six weeks. Compensation didn't cover regular expenses. She had a "time" with him around the house.

Though the accident was Harry's fault, now his wife thinks he works for heartless employers who underpay him for dangerous work... who don't give a thought to his welfare or that of his wife and children.



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Hy-Test models fit for every job. Many fit for Sunday, too.

Thus, Hy-Test Safety Shoes contribute to labor harmony. They also save up to 20% of *total* compensation and hospitalization costs! But it's up to you executives to see that workers wear them!

More workers wear Hy-Test's than any other safety shoe. Write for free booklet, *Industry Speaks.*

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sired for storage or shipping. The live roller conveyor mentioned above spaces the cases properly on this belt conveyor. To save space, the belt conveyor is close to the ceiling.

The operations of the take-off devices may be more easily understood by looking at the illustration. Two movable deflector platforms on rollers run in channel guides alongside the belt conveyor. Mounted on these platforms are gravity roller lines that receive the cases from the belt. Two hinged curves permit deflecting off the cases either parallel with the belt or at right angles to it.

The first movable deflector platform has an automatic selective deflector that selects the cases according to height. The two lines now pack only two case sizes at a time, but the mechanism could be amplified to handle a greater variety if needed as additional lines are installed. An adjustable support spans the belt and carries on one side a light source, on the other a photoelectric relay. A thin beam crosses the belt; the height of the beam can be raised or lowered by an adjusting screw until it just clears the top of the lowest case handled. Any packages higher than this minimum therefore cause the deflector to operate and direct the travel of the cases; high cases can be taken off at the deflector platform and low cases permitted to go by. Obviously, either high or low packages can be diverted off the belt conveyor by a simple adjustment of a selective switch.

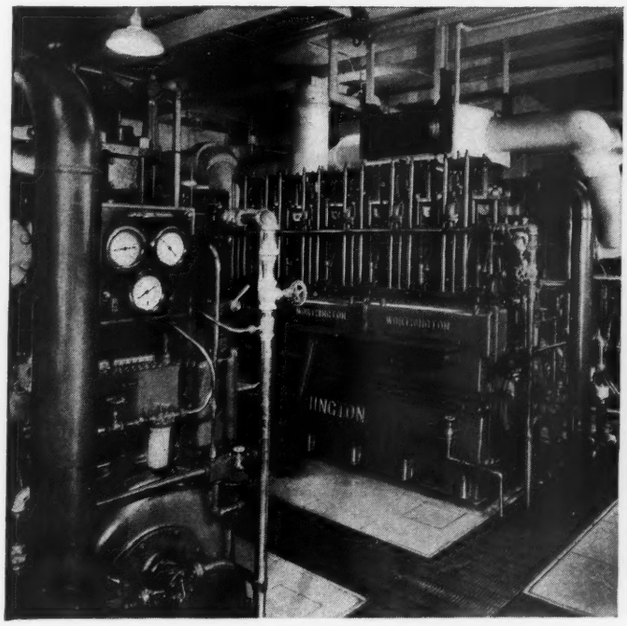
Deflected at Will

Cases may be deflected off the belt conveyor at any desired point. Movable take-away chutes are provided—only two, now, to accommodate the two sizes of cases, but this likewise can be increased. This arrangement permits take-off from the belt conveyor at whatever point on the floor is most convenient either for storage or for shipment.

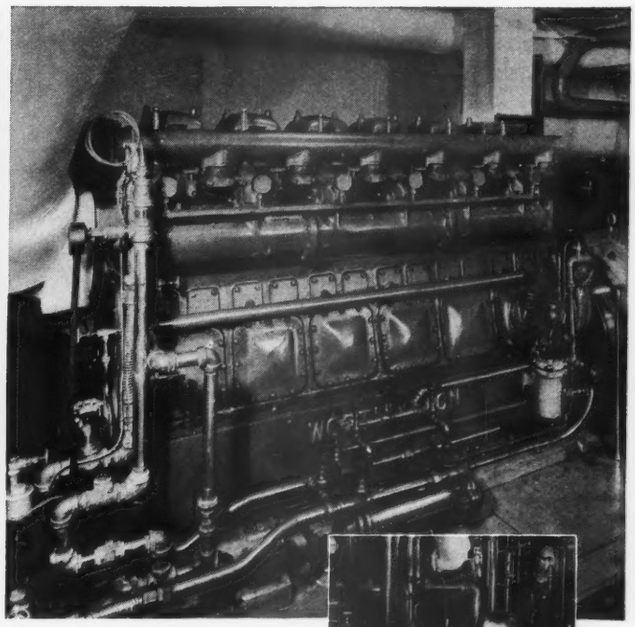
Finished stock is stored on pallets and is handled and stacked with a high-lift power truck. Stockroom and shipping room are on the same floor, and are under the management of the shipping clerk. But the two activities are kept wholly separate. Stock cannot be delivered from stockroom to shipping room in less than one-pallet lots. A pallet-load is broken in the shipping room, never in the stockroom.

In conclusion, it should be pointed out that all the equipment has been designed and placed to save space and to permit practically 100 per cent automatic operation; the two go together, since space-saving often places a unit at a level not convenient for manual operation.

PISTON INSPECTION PERIODS EXTENDED 1,000 hrs.



Two of the 6 **WORTHINGTON DIESELS** in the A. I. Namm & Son plant. One 125 h.p., 510 r.p.m. unit and four 300 h.p., 400 r.p.m. engines were installed early in 1936. Another 150 h.p., 600 r.p.m. Worthington has been in service about a year. All are Texaco lubricated.



THIS WORTHINGTON DIESEL is one of the six. Performance has been excellent. Engines are cleaner, more efficient since lubricated with Texaco.

CHIEF ENGINEER, HARRY WAITE, since changing to Texaco in December 1936, reports definite reduction in carbon formation in cylinders and on pistons. Sticking rings have been eliminated.

IT'S THE PLANT of A. I. Namm & Son, Brooklyn, N. Y., Harry Waite, Chief Engineer.

Today Mr. Waite is getting an additional 1,000 hours of service between piston inspections.

This great improvement is one result of changing over to Texaco Algol and Ursa Oils.

Another improvement from the use of Texaco in this plant was an increase in time between crankcase cleanings. Experiences such as this, repeated many times over, show why more stationary Diesel h.p. in the United States is lubricated with Texaco than with any other brand.

To get Texaco Perfected Lubrication in *your* plant, phone the nearest of our 2229 warehouses. Trained engineers will help you in the selection and use of Texaco Algol and Ursa Oils.

The Texas Company, 135 East 42nd St., New York.

BE SURE YOU READ THIS . . . Texaco's "Diesel Operation," 80 pages of charts, diagrams, photographs, and text that you will find helpful. Write for your copy.

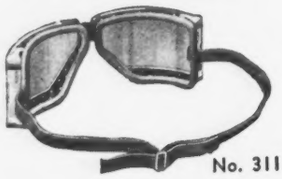
Texaco Dealers invite you to tune in The Texaco Star Theatre—a full hour of all-star entertainment—Every Wednesday Night — Columbia Network—9 E.D.T., 8 E.S.T., 8 C.D.T., 7 C.S.T., 6 M.S.T., 5 P.S.T.

TEXACO ALGOL and URSA OILS

PERFECTED LUBRICATION FOR DIESELS

WEAR GOGGLES

AVOID COMPENSABLE EYE INJURIES



No. 311

All industries that involve hazards to sight now recognize fully the value of appropriate devices made for specific operations.

SELLSTROM

EXCEL QUALITY EYE PROTECTORS

This line enjoys increasing demand because of its comfort to wearers through lighter weights and improved fitting qualities. Scientifically correct; economical.

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New Catalog on Request

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Sellstrom Manufacturing Co.

643 N. Aberdeen St. Chicago

THIEF!

"WASHROOM INFECTION" steals Time, Money, Health

Onliwon gives Effective, Economical Protection

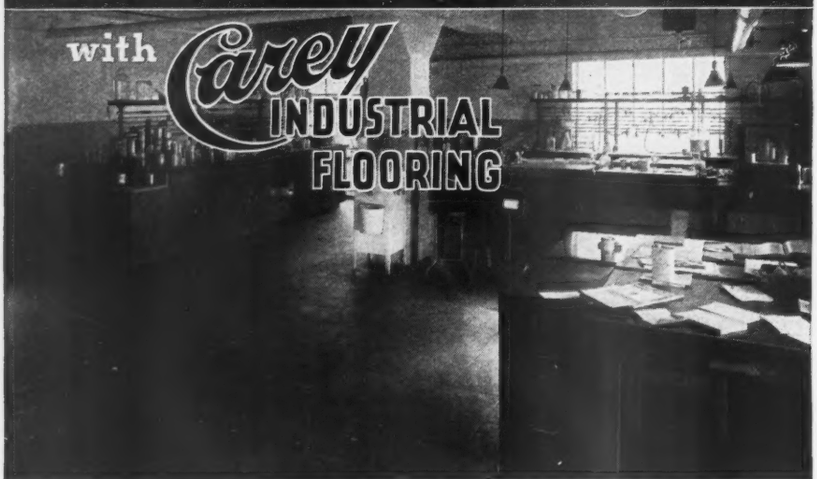
Hard-headed business men know that good health means profitable business . . . sickness means *loss!* Protect employes and you insure your profits. For details of the Onliwon service, call your local A.P.W. distributor, or write to A.P.W. Paper Co., Albany, N. Y.

A.P.W.

Onliwon Towels and Tissue

The economy washroom service

Sherwin-Williams Quiets Steel Floor with Carey INDUSTRIAL FLOORING



Part of the second floor of one of the Sherwin-Williams buildings, Chicago, is used as a laboratory; part for empty barrel storage. To reduce the noise that would have resulted from handling barrels on a steel deck, the entire second floor (2700 sq. ft.) was surfaced with **Carey Industrial Flooring.**

But Sherwin-Williams discovered that in addition to noise reduction, this modern flooring has other advantages. Being resilient, it is easy on the feet of employees and steps up their working efficiency.

Carey Industrial Flooring is remarkably dense and tough; provides a safe trucking surface; is ready for use immediately when laid; easily repaired, if damaged. Write Dept. 31 for detailed information.

THE PHILIP CAREY COMPANY • Lockland, Cincinnati, Ohio

Dependable Products Since 1873

BRANCHES IN PRINCIPAL CITIES

Sell the Operator on a Better Way

(Continued from page 53)

proved operation? Looking at the upper part of the chart, we see that while the right hand does some work the left hand is idle. Then the left hand does some work while the right hand is idle. Next the right hand works while the left holds the pack of matches. Only one hand is working at a time. Many factory operations look the same when analyzed. We have two eyes, but they focus on only one thing at a time. From observation this operator was busy all the time. But the chart shows the real picture.

Suppose we provide a holder for the pack as shown in Figure 10 to free the hand for useful work. We arrange the layout to have the operator get the cigarette with his left hand while he gets and lights a match with the right hand.

Figure 11 is a chart of this second improved method—1 1/5 seconds or approximately one-third of the time required for the original method. It is now a well-balanced operation.

Called for a Race

In our meetings we always called for volunteers for a race—one to light a match by the first method and the other to use the third method. Of course the operator on the improved method had finished before the other was able to get a match out of the box.

From watching a demonstration like this, operators could easily see that methods made a great difference in the amount of work required for doing the job. We asked them if a foreman or supervisor could drive a worker using the first method to get out as much production as the worker using the third method could easily do. Of course they could see that speed-up in any form could not equal improved methods.

We have used this demonstration to show how improved methods were worked out and provided the basis for increased production. We always selected an operation from our production lines for these groups to analyze; we showed them how we calculated the effective time and made a chart of their operation. We next went over the chart pointing out what caused each item of loss or ineffective time. They would suggest ways of eliminating the loss and balancing the operation. The last group of this kind

(Continued on page 140)

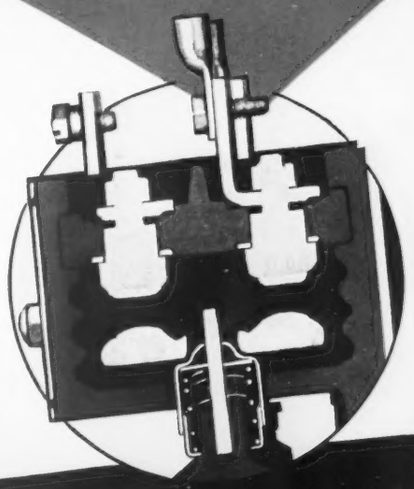
The Secret of ALLEN-BRADLEY Current Interrupting Capacity

This cross-sectional view of the contacts shows why high currents are so easily disrupted. (1) The double break contacts cut the voltage on each contact in half. (2) The arc gap is set for the most effective current interrupting capacity. (3) The patented silver contacts contain cadmium which has a deionizing effect. Allen-Bradley solenoid starters will easily disrupt currents of not less than ten times their maximum horsepower rating.

"That switch disrupts every other arc so now he's trying lightning!"

Lightning may be a little too much for the Allen-Bradley solenoid starter, but try this starter on your motor control circuits! No matter what your motor load conditions may be—full load, overload, or locked rotor—here is a starter that will easily handle them. Arcs are quickly snuffed out, reducing the possibility of contact burning.

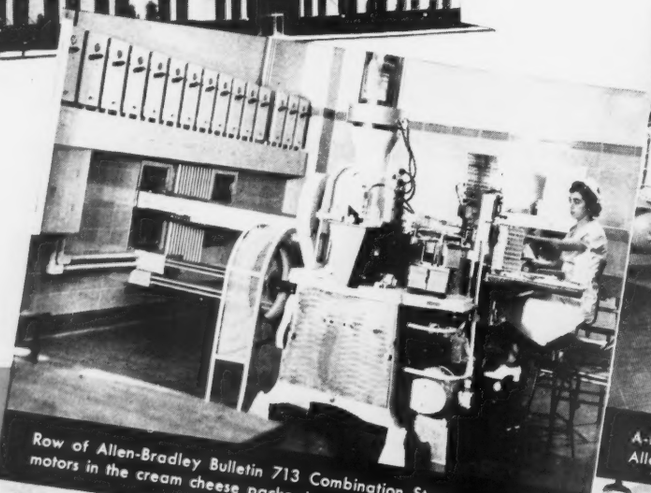
Furthermore, you never have to clean or file the double break, silver alloy contacts on Allen-Bradley solenoid starters. These starters can be installed and then forgotten. Their simple construction is a guarantee of the absence of trouble. Installation is unusually easy, too. Available in three ratings and seven types of enclosing cabinets. Specify Allen-Bradley solenoid starters on your next control job.



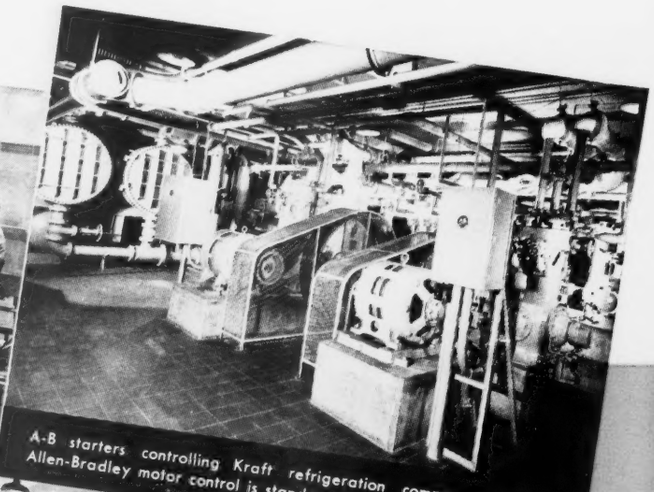
ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

HOW KRAFT
automatically controls the motors in their new Chicago plant

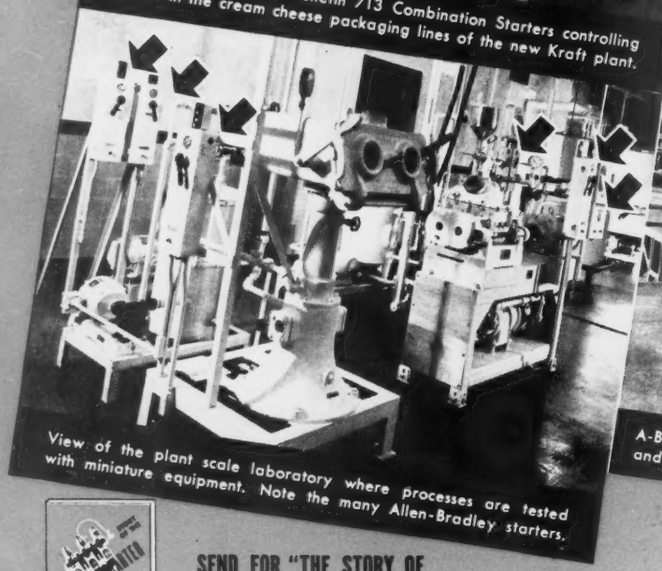
You will find Allen-Bradley solenoid starters and push button control stations on all of the important production lines in the new international headquarters building of the Kraft-Phenix Cheese Corporation, in Chicago. These Allen-Bradley starters are as modern and efficient as every other part of this fine new plant. They were selected on their record of performance in other Kraft plants. Specify Allen-Bradley control for *your* motors.



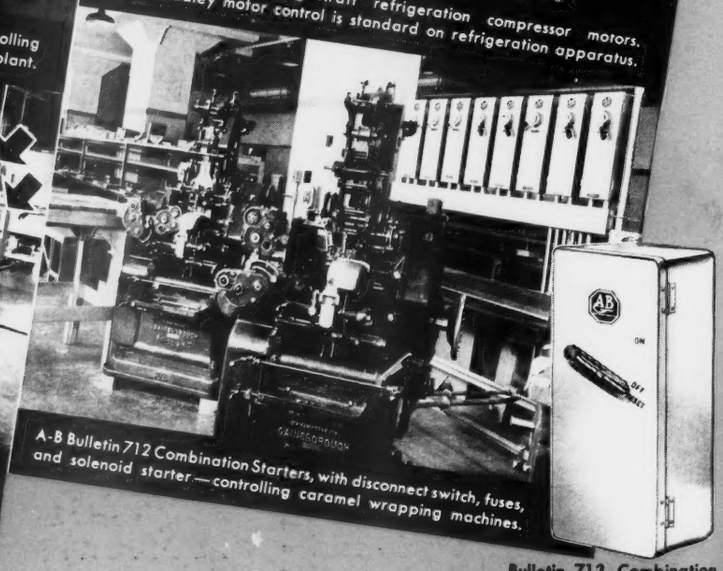
Row of Allen-Bradley Bulletin 713 Combination Starters controlling motors in the cream cheese packaging lines of the new Kraft plant.



A-B starters controlling Kraft refrigeration compressor motors. Allen-Bradley motor control is standard on refrigeration apparatus.



View of the plant scale laboratory where processes are tested with miniature equipment. Note the many Allen-Bradley starters.



A-B Bulletin 712 Combination Starters, with disconnect switch, fuses, and solenoid starter—controlling caramel wrapping machines.

Bulletin 713 Combination Starter with special white enameled enclosure.

SEND FOR "THE STORY OF THE SOLENOID STARTER"

Allen-Bradley Company
1321 S. First Street
Milwaukee, Wisconsin

Please send me "The Story of the Solenoid Starter."

Name.....

Company.....

Address.....

City.....State.....

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

By Gearing the Flow of Materials to the Flow of Minutes . . .

LAMSON CONVEYORS

Here are two typical case histories among the thousands recorded in the field notebooks of LAMSON engineers. Case histories that show how LAMSON'S 50 years of SPECIALIZED EXPERIENCE in materials-handling and motions-economy have *increased the speed* and *lowered the cost* of production for hundreds of America's better-known plants.

LAMSON engineers follow no set formula. Their long experience . . . their resourcefulness and skill that have been thoroughly developed by solving handling problems under a wide variety of plant conditions . . . plus the fact that they have a complete line of conveying equipment to draw on . . . thoroughly equip them to provide an efficient answer to your handling and routing difficulties. They are not tied down to any type of conveyor. That's why they are so successful in devising new and improved short-cuts and in effecting installation economies that meet every need.

Don't buy any materials-handling equipment until you consult a LAMSON engineer. Maybe your present conveyors just need rearrangement. It will cost you nothing to find out. Mail the coupon for a free consultation and survey, or ask for our latest literature on this basic industrial problem—a pictorial book showing actual installations of new developments in the conveyor field.

LAMSON CONVEYORS

Send for this
FREE BOOK
Illustrates valuable short-cuts to more profitable production

The LAMSON COMPANY, Inc.
Syracuse, N. Y.

Without cost or obligation, please
☐ have your nearest engineer call,
☐ send me your latest conveyor book.

Name.....
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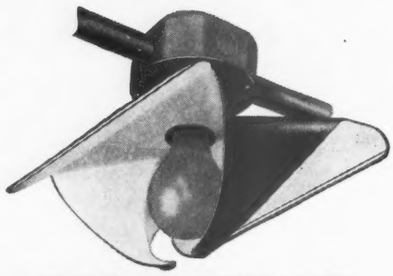
—and you can save money when proper illumination permits clerks to read comfortably anywhere in the aisles—to see clearly into bin interiors —from top to bottom shelf. It expedites handling of orders, reduces mistakes.

THE STOCKLITE

Designed especially for use in narrow aisles, it directs light where it is really needed, eliminates aisle glare, provides far better illumination with the same lamps you are using. The Stocklite, an exclusive Goodrich product, is finished in permanent porcelain enamel.



IT'S THE ODD SHAPE THAT DOES THE TRICK

A new bulletin, "Light on the Subject of Stock Bin Illumination," shows how many leading concerns use this fixture to improve working conditions in their stock rooms. Ask us to send you Bulletin No. 91.

MEMBER OF R. L. M. STANDARDS INSTITUTE

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 2904 N. OAKLEY AVENUE, CHICAGO, ILL.

spent four sessions analyzing a new packing operation that had not been standardized. The two following sessions they studied the chart and worked out improvements that reduced the time to less than one half.

That was a better job of improving methods than our engineering department usually does. There were about twenty people in the group. Approximately half were gang leaders and supervisors, the other half pieceworkers. Almost every department had a representative. After this series of meetings, these people had a good general idea of how improved methods were worked out and knew that new and higher production standards were actually based on facts and figures.

Sure Now to Ship on Time

(Continued from page 61)

through. The girl typed the data as before, but on a white strip this time. Progress, since no proof had to go out, was recorded with a blue pencil—and again it will be seen that the order was shipped March 28, as scheduled.

The outstanding advantage of this system is that it is always right up to the minute. A flick of a lever, and the chief dispatcher is getting his report from each department. There is no time wasted, no clerical work except the trifling amount done by the chief dispatcher when he jots down the order numbers as his dispatchers call them off. The chief dispatcher can also call any station at any time and ask for a report on a given order. His only other bit of clerical work is to make a list of slow orders at the end of the day. He does this by laying a straightedge on the strips in the frames. This information is transmitted to the dispatchers whose job it is to check up and report back.

A further advantage of this production control plan is that, unlike some others in use, it does not make a clerk of the foreman. He has nothing to do with the scheduling and follow-up of orders in his department, but can devote his entire time to supervision.

What Kind of Plant Newspaper

(Continued from page 65)

dance, a banquet, a card tournment, or a ministrel show, write up the activities. In a word, play up their interests.

If there is a candid camera crank in your organization—and we'll bet

A Wright Arch Preserver Shoe

Unisorb*—

CUSHIONS MEN AND MACHINES!

• Illustrating the Versatility of FELTERS CERTIFIED UNISORB

GOLF SHOES should be snugly laced and should not bind or chafe the instep. After tests with many materials, E. T. Wright Company, makers of the world-famous Wright Arch-Preserver Shoes, solved this problem of comfort by replacing the usual leather lining with a soft, resilient cushion of Certified Unisorb. Felter's Certified Unisorb was selected for greater resiliency and resistance to conditions destructive to most materials.

In machinery too, Felters engineers are continually cushioning new machinery for vibration isolation with Certified Unisorb. They will gladly apply their experience and ingenuity to *your* problems. Send for the free illustrated booklet on vibration which demonstrates some of the installations we have made.

THE FELTERS COMPANY, INC., Dept. AB, 210 SOUTH ST., BOSTON, MASSACHUSETTS

Offices at New York, Chicago, Philadelphia, Detroit, St. Louis, Dallas, San Francisco • Mills at Johnson City, N. Y., Millbury, Mass., Jackson, Mich.

* Reg. U. S. Pat. Office

Don't Wait

FOR AN EARTHQUAKE

TO SHOW YOU THE DESTRUCTIVE FORCE OF

Uncontrolled Vibration!

You can't control an earthquake or prevent its damage but — YOU CAN CONTROL MACHINERY VIBRATION, which slowly but surely results in similar damage to industrial plants and equipment. The following facts are no joke when they appear as losses on your balance sheet:

- Vibration spoils precision work.
- Vibration increases maintenance and repair expense.
- Vibration hastens employee fatigue resulting in accidents and mistakes.

Modern industry no longer tolerates machinery vibration transmission any more than poor ventilation or improper lighting. To effect substantial operating savings, investigate Korfund Anti-Vibration Products and Engineering.

OVER 200,000 SUCCESSFUL INSTALLATIONS ON EVERY TYPE OF INDUSTRIAL MACHINE

REQUEST YOUR COPY OF

"ELIMINATING VIBRATION LOSSES"

KORFUND COMPANY, INC.

48-25 THIRTY-SECOND PLACE, LONG ISLAND CITY, NEW YORK

Specialists in VIBRATION CONTROL *for 30 years*

there are plenty of them—encourage these snapshot hounds to submit photographs of scenes and employees taken in and about your plant. A liberal use of illustrations heightens the interest of any publication.

Don't Preach to Employees

What kind of news stories shall we avoid? Shun all controversial subjects particularly anything that deals with religion or politics. In your editorials beware of preaching or dictating to employees. They will resent it. Do not give excessive space to stories about your executives and their social activities. In fact, the farther in the background any mention of executives is kept, the better. Do not use too much "boiler plate" material—articles that have no particular relation to your plant or product. And above all beware of personal items that have a veneer of humor, yet may hurt the feelings of some individual.

There you are. That's all there is to bear in mind when publishing a plant newspaper. Well, nearly all, anyway. One final word—maybe Charlie Olin, late advertising manager of New Departure had the right idea. In talking to us lads who dug up general stories for *New Departure News*, Charlie would pound the desk and emphatically announce to the world at large: "What we want in this paper is names, names, names!" That is good advice.

TRADE LITERATURE

Air Conditioning—Catalog CE114. Air conditioning, refrigeration, and heating equipment. Applications, operation, installation, dimensions, and sizes.—Carrier Corp., South Geddes St., Syracuse, N. Y.

Batteries—Catalog Section. Heavy-duty truck bus, and diesel starting batteries. Construction of the battery line, illustrations, specifications, and plate dimensions. —The B. F. Goodrich Co., Akron.

Cable Covering—Folder, "Sunex Securityflex" covering—resistant to sun, heat, moisture, alkalis, and acids.—Anaconda Wire & Cable Co., 25 Broadway, New York.

Car Pullers, Hoists, Winches—Catalog 7738. Specifications, dimensions, and engineering information. — Stephens-Adamson Mfg. Co., Aurora, Ill.

Chain Drives—Data Book. Forty-eight pages on "Silverstreak" silent-chain and "Silverlink" roller-chain drives for automotive and stationary engines.—Link-Belt Co., 307 North Michigan Ave., Chicago.

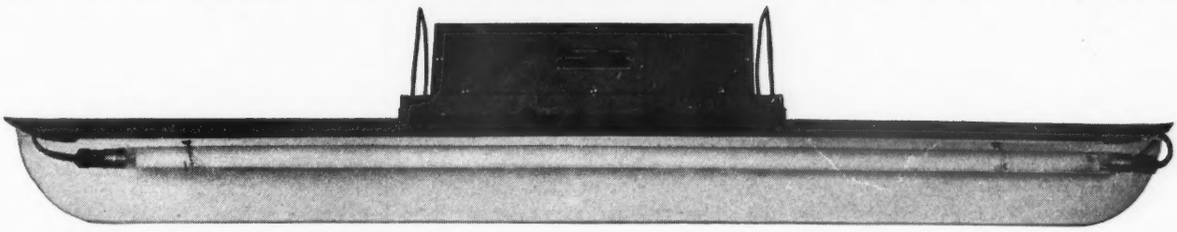
Coal Handling—Bulletin 331. "Rex" coal and ash handling equipment. Conveyors and bucket elevators.—Chain Belt Co., Milwaukee.

Connectors—Catalog 38-D. A 168-page, indexed catalog giving detailed data on bus and cable connectors.—Delta-Star Electric Co., 2400 Block, Fulton St., Chicago.

Controller—Bulletin 523. Model 6089-V single-cam cycle controller equipped with 3-way leakless pilot valves.—The Bristol Co., Waterbury, Conn.

Controls—Bulletins. LC; boiler, furnace, and fan controls. CR; refrigera-

TO MEET INDUSTRY'S DEMANDS FOR ECONOMICAL HIGH ILLUMINATION LEVELS...THE NEW COOPER HEWITT



100-watt fluorescent lamp

"Better Than Daylight" engineered with Cooper Hewitt Mercury Vapor Lamps—Cooper Hewitt Fluorescent Lamps

CONSUMING only 100 watts, this lamp has an output of 5,000 lumens—the greatest output of any lamp of equal wattage now on the market. It provides a cool blue-white light, blending well with daylight. Details are easily seen. It is psychologically cool and actually cool from a physical standpoint thus decreasing the air-conditioning load. » » » Industrial plants of every kind will find it the answer to better employee welfare and better production which inevitably follows when lighting levels are raised and engineered to produce non-fatiguing illumination. Write for a copy of the new bulletin describing Cooper Hewitt Fluorescent Lamps. General Electric Vapor Lamp Company, 815 Adams Street, Hoboken, New Jersey.

GENERAL ELECTRIC VAPOR LAMP COMPANY

937F

216,500 CFM at 408° F.

Picture shows one of two Clarage RT Fans selected by Indianapolis Power & Light Co. for induced draft. Flue gases are handled at 408° F. Operation is continuous. This is by no means a snap job!

WANTED! -- *Tough Air Handling and Air Conditioning Jobs . . . . .*

A fan company that can meet the EXACTING demands of mechanical draft is certainly a good organization to consult regarding any other air handling or conditioning requirement—and that company is Clarage. Our experience dates back more than 25 years — our line complete to meet all industrial needs. May we have your next inquiry?

SPECIFY CLARAGE for
COMPLETE AIR CONDITIONING
VENTILATION
HEATING
COOLING
MECHANICAL DRAFT
FANS & BLOWERS FOR INDUSTRIAL NEEDS

CLARAGE FAN COMPANY • Kalamazoo, Mich.
SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

JOHNSON No. 650 Heat-Treating Furnace

• Powerful, Even Heat *Without Blower!*

SIX powerful JOHNSON Direct Jet Burners produce temperatures up to 1800° F. in the firebox, *without air-blast.* Ideal for heat-treating any carbon steels, does most jobs without requiring muffle. There is no oxidation. Perfect combustion insures lowest fuel consumption, on any type gas. Door is 40" from ground for convenience. Cut your heat-treating costs with JOHNSON No. 650. Send for catalog and low prices—*now!*

JOHNSON GAS APPLIANCE CO. Cedar Rapids IOWA

MONOBELT *and* **MODERN GROUP DRIVES**

AN EFFICIENT MONEY SAVING POWER TRANSMISSION COMBINATION! TODAY, WRITE FOR ILLUSTRATED CATALOG CONTAINING H. P. TABLES.

ALEXANDER BROTHERS
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tion, temperature, and pressure controls, CS; stoker control sets and accessories.—Julien P. Friez & Sons, Baltimore.

Controls—Folder. Temperature controls.—Burling Instrument Co., 241 Springfield Ave., Newark, N. J.

Controls—Data Sheet 225. Hydraulic-action, "solid-liquid-filled" controls.—Julien P. Friez & Sons, Baltimore.

Controls—Catalog. Motor control apparatus, battery-charging equipment, rheostats, resistance units.—Schaefer Bros. Co., 1059 West Eleventh St., Chicago.

Electrodes—Descriptive Data 26-650. A.c. crucible weld electrodes for welding low or medium-carbon steel, cast iron, stainless steel, manganese steel, for hard surfacing and arc cutting.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Eyeshields—Folder. For use in soldering, flash, gun, gas and spot welding operations. — The Jackson Electrode Holder Co., 15122 Mack Ave., Detroit.

Fans—Bulletins 443 and 444. "Axiflo" pressure fans. Performance, specifications, capacity tables.—B. F. Sturtevant Co., Hyde Park, Boston.

Fire Prevention—Bulletin 74. Care and maintenance of sprinkler equipment.—The National Board of Fire Underwriters, 85 John St., New York.

Gaskets—Bulletin and price list. Two types of gaskets—single-jacket metal-asbestos, and spiral-wound—for manholes, handholes, and tube caps of standard make boilers.—Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Gears and Reducers—Catalog 39. Single and double, 2- and 4-speed helical reducers, geared motor reducers; spur gears, V-belt pulleys, couplings, splines, broaches, chains and sprockets. Tables and prices.—The Ohio Gear Co., Inc., 1333 East 179th St., Cleveland.

Hoists—Catalog 127. Applications of electric hoists; engineering data, dimensions, drawings, sectional views and specifications.—Shepard Niles Crane & Hoist Corp., 364 Schuyler Ave., Montour Falls, N. Y.

Lubricants—Folder 2-114. "300" series "Sta-Put" lubricants for heavy-duty inclosed gears, bearings carrying heavy loads, conveyors.—E. F. Houghton & Co., 240 West Somerset St., Philadelphia.

Materials Handling — Folder. "Carloader" handles materials, parts and finished products in package form.—Clark Tructractor, Div. of Clark Equipment Co., Battle Creek, Mich.

Motors—Folder DMF-5850. Capacitor-start fractional-horsepower motors for refrigerators, water coolers, stokers, pumps, compressors, machine tools.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Motors—Folder DMF-5851. Type FH split-phase, fractional-hp. motors, 1/50 to ⅓ hp. for fan, blower, oil burner, unit heater, centrifugal pump and woodworking tool applications.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Paint—AD 129. Aluminum paint for wood priming.—Aluminum Company of America, Gulf Bldg., Pittsburgh.

Panelboards.—Bulletin 392. Rocker-type panelboards for control of lighting and small power circuits.—Bull Dog Electric Products Co., 7610 Jos. Campau Ave., Detroit.

Plastics—Folder. Uses of "Durez."—General Plastics Inc., North Tonawanda, N. Y.

Pumps—1939 Data Book. Engineering data, 148 pages; pump listings, 108 pages.—Economy Pumps, Inc., Hamilton, Ohio.

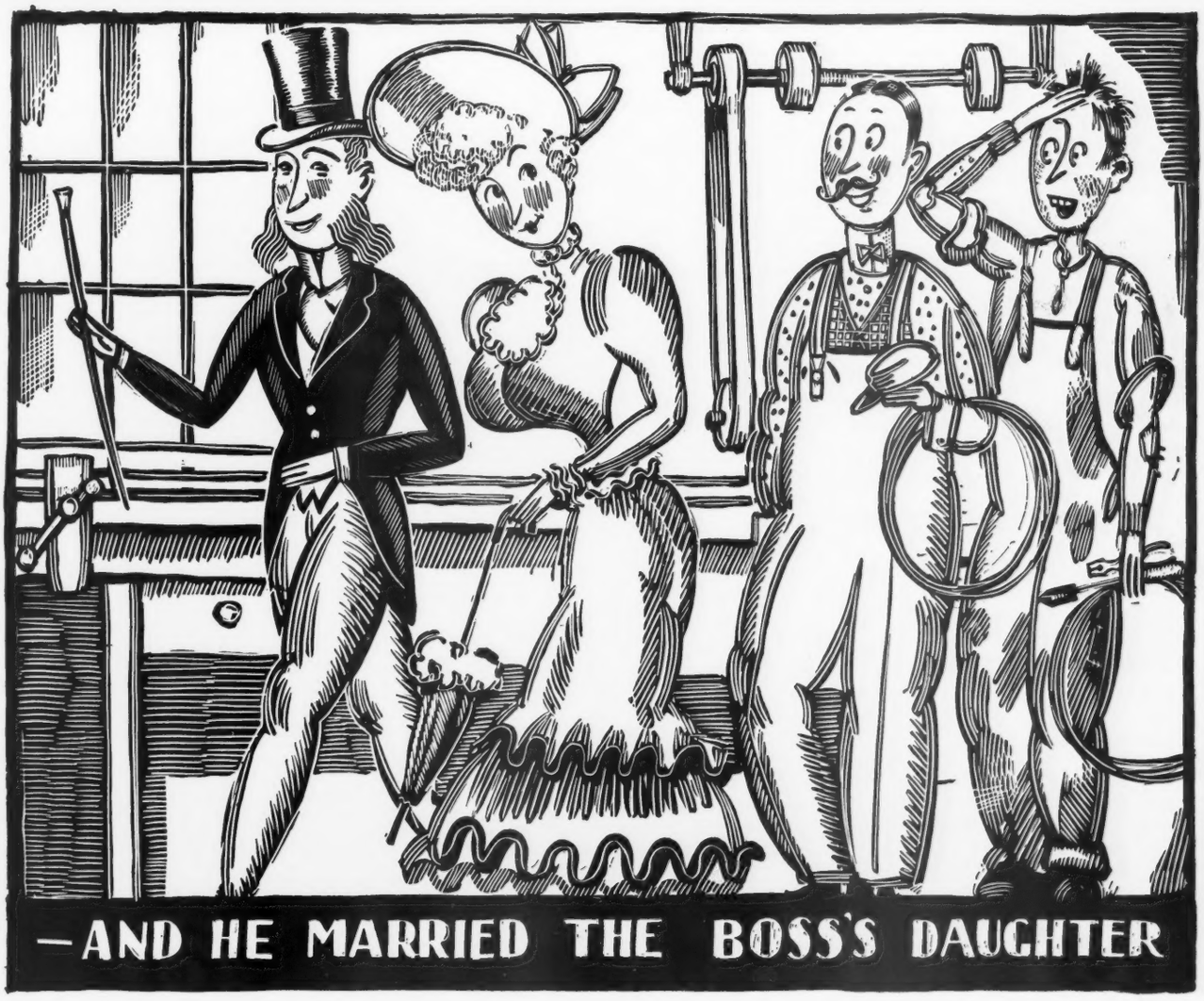
Receivers—Form 9202. Receivers for air or gas with maximum pressures of 125, 250, 350, and 500 lb.—Ingersoll-Rand Co., Phillipsburg, N. J.

Roof Cement—Folder. Cold processed pure mineral asphalt for roofing, waterproofing, calking.—Flexrock Co., 23d & Manning St., Philadelphia.

Roofing—Catalog ADV 320. Special and standard steel roofing products and styles, "Republic" galvannealed sheets and "Enduro" stainless steel sheets.—Republic Steel Corp., Cleveland.

Saws—Form 260, page H-9. Heavy-duty, high-torque electric saws. Tilting base and plain base models.—Syntron Co., Homer City, Pa.

Shows and Exhibits—1939 Supplement. First supplement of Fourth Annual Edition of 1939 Shows and Exhibits. Lists national, regional, state and local trade,



—AND HE MARRIED THE BOSS'S DAUGHTER

JACK, the electrician, was never one to be satisfied with less than the best; that's why the boss's daughter is now Mrs. Jack. The same characteristic is probably behind his insistence upon Rockbestos, the wire with "Ten Tested Values," for circuits that were periodic trouble-makers because of breakdowns resulting from exposure to heat and moisture, oil, grease or corrosive fumes.

Rockbestos heat-resisting wires, cables and cords will reduce your maintenance expense and prove more economical in length of service, because they are made to stand up under operating conditions that are destructive to other wires. Their asbestos insulation doesn't dry out and crack under heat, or with age; neither does it rot, bloom or swell under the attack of oil, grease or corrosive fumes. In addition, it gives you the safety factor of a fireproof wire and the other extra advantages listed in the "Ten Tested Rockbestos Values."

If you want to save money and improve your service let us make recommendations and send samples, or, if you prefer, we'll have one of our engineers call on you. If you haven't one of our catalogs write for the new No. 10-E Handbook illustrating our line of standard constructions. . . Rockbestos Products Corporation, 920 Nicoll Street, New Haven, Connecticut.

TEN TESTED ROCKBESTOS VALUES

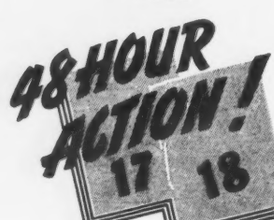
1. Heatproof
2. Fireproof
3. Permanent
4. Lower maintenance cost
5. Resists heat and vibration
6. Saves work
7. Oil and Greaseproof
8. High overload capacity
9. Permanently flexible
10. Greater carrying capacity

Also refer to Electrical World Buyer's Reference

ROCKBESTOS A.V.C.—*the wire with permanent insulation*

ROCKBESTOS — PERMANENTLY INSULATED WIRES AND CABLES

ONLY PERFORMANCE WILL SHOW THE DIFFERENCE BETWEEN TWO BRANDS OF SANDPAPER
BUT IT'S EASY TO SEE THE DIFFERENCE BETWEEN TWO BRANDS OF SERVICE!



. . . . . ON STANDARD ORDERS

The minute *any* regular order hits our delivery desk it gets real "RUSH" service — with red tape and delays eliminated — yet with careful attention to every detail. Action is *guaranteed* within 24 hours.

. . . . . ON SPECIAL ORDERS

There's no need to hold up production for a week or ten days while a special belt or disc is being made up. AP'S flexible production schedule — designed to be broken — assures 48-hour action on any abrasive specialty . . . your order is filled in hours instead of days!

REAL TECHNICAL HELP

You can level off the "high spots" in finishing costs, with AP Technical Assistance. Your AP man is a real engineer with a background of extensive field experience . . . and is backed by the AP Laboratories on any problem too complicated to be solved unassisted. This unique sales-engineer-laboratory set-up means more profit from present equipment, better finishing, and lower cost-per-piece for every manufacturer who will take advantage of it. No obligation! Write Abrasive Products, Inc., 519 Pearl Street, South Braintree, Mass.

ABRASIVE PRODUCTS INC.

JEWELOX • JEWEL EMERY • JEWEL GARNET • JEWELITE • JEWEL FLINT • NEW PROCESS

industrial, professional shows for 1939. $2 per copy.—Exhibitors Advisory Council, Inc., 120 Greenwich St., New York.

Telephones — Folder. Voice-powered "Telfair Telfone" for selective or party line use.—Telfair Telfone Corp., Chrysler Bldg., New York.

Thermometer—Bulletin 4100. Dial-indicating thermometer. Range, 0-1,000 deg. F.—Wheelco Instrument Co., 1929-33 South Halsted St., Chicago.

Tools—1939 Catalog. Fifty-six pages of portable electric tools. Includes the new 3/16-in. Hornet Drill, 5/16-in. Ball Bearing Utility Drill, No. 36 Portable Electric Hammer.—The Black & Decker Mfg. Co., Towson, Md.

Tools and Instruments—Catalog. Mechanics' and optical inspection tools, gear testing equipment, bore inspection telescope, sine bar bevel protractor.—George Scherr Co., Inc., 128 Lafayette St., New York.

Tools—Catalog 54. Condensed catalog of electrical tools—portable, bench, and floor.—The United States Electrical Tool Co., Cincinnati, Ohio.

Vacuum Cleaners—Bulletin 120-F. Stationary and portable systems for cleaning floors, walls, pipes, machinery.—The Spencer Turbine Co., Hartford, Conn.

Valve Control—Folder. Type M-5 Limitorque valve control. Specifications and dimensions. — Philadelphia Gear Works, Erie Ave. & G St., Philadelphia.

Washrooms—Pamphlet P225. Diagrams of washroom layouts. Fixture capacities and clearances.—Bradley Washfountain Co., North 22d and West Michigan Sts., Milwaukee.

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BOOKS

PAINTS AND PAINTING

G. C. Molleson, Design Engineer, Department of Public Works, Richmond, Va. David McKay Co., 604–608 South Washington Square, Philadelphia. 247 pages, index, illustrations. $2.

To assist the maintenance engineer and others responsible for preservation of buildings and equipment, and the purchasing agent, the author has compiled practical rather than technical information about the formulation, properties, and application of various paints, their suitability to various purposes, the corrosion of metals and decay of wood. A description of the most generally used pigments and vehicles is given; also, approximate formulas for different uses of paints and varnishes, and formula numbers of the Federal Specification Board, the Army and Navy, and the American Society of Testing Materials.

CAPITAL GOODS AND THE AMERICAN ENTERPRISE SYSTEM

Machinery and Allied Products Institute, 221 North La Salle St., Chicago. 86 pages, chart, index. No charge for single copies.

Discusses the economic and social principles underlying the inter-relationships of the capital goods industries and the American system of competitive private enterprise today. Not only are problems relating to technological unemployment, the significance of capital goods, savings and investments considered, but also those concerning government control of the national income, and governmental obstruction to the flow of capital.

PROBLEMS AND PROCEDURES OF UNEMPLOYMENT COMPENSATION IN THE STATES

Walter Matscheck and Raymond C. Atkinson, Committee on Social Security of the Social Science Research Council. Public Administration Service, Publications Division, 1313 East 60th St., Chicago. 85 pages. $1.25.

Based on more than two years of study and field investigation in two-thirds of the states that paid unemployment compensation during 1938, this report focuses attention upon administrative matters raising questions about procedures and legislative action. Such problems confronting federal and state administrators as coverage and contribution collection,

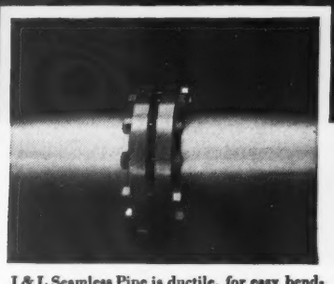
POWER PIPING jobs of *J & L Seamless* give you longer service... are safer... more dependable... because *J & L Seamless* can take it

There's extra strength in every length of J & L Seamless Pipe—strength that assures safety, long life and greater operating efficiency.

J & L Seamless Pipe has no weak spots where ruptures can occur. It is pieced from a solid billet, then expanded and rolled to final dimensions. There are no welds... therefore no chance of a failure occurring at or near a weld.

J & L Seamless Pipe offers maximum resistance to corrosion . . . heat and high pressure. Because of the special selected steel used in its manufacture, J & L Seamless Pipe is easy to bend and coil. When faced with complicated upsetting and machining jobs, pressure joint manufacturers like the excellent working qualities of J & L Seamless for they get better joints that assure trouble-free installation and that give long years of service and complete customer satisfaction.

Installations in power and processing plants throughout the country are proving the safety, economy and efficiency of J & L Seamless Pipe.



J & L Seamless Pipe is ductile, for easy bending, coiling and upsetting . . . strong, for safety and long life.

Make your maintenance dollars go farther. Specify J & L Seamless Power Piping for both new installations and replacement work.

Write for this J & L Tubular Pipe Handbook —SP-4, on your business letterhead. It contains valuable application data, including a steam flow chart, that will help you.

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AMERICAN IRON AND STEEL WORKS
PITTSBURGH, PENNSYLVANIA

MAKERS OF HIGH QUALITY IRON AND STEEL PRODUCTS SINCE 1850

J & L—ALWAYS MAKING FINER CARBON STEEL PRODUCTS FOR NEW AND BETTER USES

DON'T COMPROMISE WITH QUALITY!

After all, it isn't the cost of the truck that counts . . . it's the cost of pushing the truck. Only about one two-hundredths of the cost of hand truck transportation is represented by the cost of the truck. The remainder is wages.

The important thing about hand trucks is not so much their initial cost, but how much they will reduce operating expenses by speeding up trucking operations. The inherent superiority of "American" Pressed Steel Hand Trucks lies in their better balance, their greater ease of handling, and their rugged strength. Men can make more trips and carry more material with "American" Trucks. The strength of "American" Pressed Steel construction reduces maintenance and accidental damage costs to a negligible amount.

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PRESSED STEEL
HAND TRUCKS

benefit procedure, employee earnings records, base period and benefit year, weekly benefit rate, partial unemployment, seasonality, and merit rating are analyzed. A complete draft of a benefit procedure designed to simplify and coordinate present practices is included.

PRACTICAL ELECTRIC ILLUMINATION AND SIGNAL-WIRING METHODS

Terrel Croft, Consulting Electrical Engineer, revised by George H. Hall. McGraw-Hill Book Co., Inc., 330 West 42d St., New York. 351 pages, index. $3.

Third edition brings up to date information on incandescent lamps and their uses, illustrates and describes high-intensity mercury-vapor lamps and sodium-vapor lamps. Both interior and exterior illumination are discussed, and lighting requirements analyzed. The book also treats circuit design, selection and installation of fixtures, and covers signal wiring in line with 1937 National Electrical Code requirements.

SEVENTH INTERNATIONAL MANAGEMENT CONGRESS PROCEEDINGS

The National Management Council of the U. S. A., 347 Madison Ave., New York. 340 pages. $2.

The Proceedings of the Seventh International Management Congress held in Washington, D. C., September, 1938. Included are papers and speeches presented at the General Sessions where the economic and social significance of scientific management was discussed by speakers representing the United States, Great Britain, France, Sweden, Czechoslovakia, Germany, and Italy; discussion at the Technical Sessions where speakers representing the United States and various foreign countries discussed recent developments in management under the divisions of administration, production, distribution, personnel, agriculture, home management, and general management.

ADJUSTING YOUR BUSINESS TO THE NEW LEGISLATION

Leo M. Cherne, Executive Secretary, Tax Research Institute. Tax Research Institute of America, Inc., 292 Madison Ave., New York. 1,065 pages, looseleaf form, index. $12.85.

To guide the executive and attorney through the rules, regulations, laws, and decisions restricting business today, the Tax Research Institute has interpreted the numerous regulations, and presented specific recommendations as aids to economical adjustment to and compliance with the Wage-and-Hour Law, Labor Relations Act, Pure Food and Drug Act, Federal Trade Commission Act, Robinson-Patman Act and others. A chart on illegal business practices is included.

HEATING, VENTILATING, AIR CONDITIONING GUIDE, 1939

American Society of Heating and Ventilating Engineers, 51 Madison Ave., New York. 1,160 pages, index. $5.

Seventeenth edition. Chapters dealing with central systems for heating, humidifying, cooling, and dehumidifying have been revised and combined into one—Central Systems for Comfort Air Conditioning. Special attention has been given to surface coils for summer and winter applications, and the chapter is illustrated with charts which indicate the performance of coils operating under varying design load and equipment conditions. Other chapters that have been rewritten are those on Combustion and Fuels, Heat and Fuel Utilization, Air, Water and Steam, Natural Ventilation and District Heating, Radiators and Gravity Convectors. Catalog data section covers 278 pages.

THE CASE FOR EXPERIENCE RATING IN UNEMPLOYMENT COMPENSATION AND A PROPOSED METHOD

Herman Feldman, Professor of Industrial Relations, The Amos Tuck School of Administration and Finance, Dartmouth College, and Donald M. Smith. Industrial Relations Counselors, Inc., RKO Building, Rockefeller Center, New York. 66 pages. $1.

Considering experience or "merit" rating in principle and in practice, the authors point out the value in the administration of unemployment compensa-

IMPROVE PRODUCT PERFORMANCE WITH CENTURY'S WIDE RANGE OF TYPES AND SIZES OF MOTORS . . .

MOTORS DOWN TO 1/100 H. P. FOR DOMESTIC MARKETS

THE *Modern* MOTOR SELECTION TECHNIQUE

Century is one of the few modern motor manufacturers who offer a wide selection of types and sizes that makes correct selection possible.

The Century organization devotes its attention exclusively in the electrical field to the manufacture and selection of motors and generators.

Century sales engineers are specialists in motor and generator selection and the accumulated experience of Century engineers is always at the disposal of anyone faced with a motorization problem whether for new design or selection for a completed machine.

A few of the many improvements by Century engineers in motors for special applications are shown in the column on the right.

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WHAT YOU GET *with* CENTURY MOTORS

★ A new higher standard of Air Conditioning performance, including quiet starting and operating—no need of over-motoring.

★ Machine Tool output held to closer tolerance, because of remarkable freedom from vibration.

★ In wet processing industries, when washing down the plant, even a careless operator can't get liquids into the Century Splash Proof Motor—ideal for outdoor installation.

★ In metal working plants, you reduce maintenance cost and production stoppages, with a Century splash proof motor to protect against splashing oils, falling chips.

★ Motors suited for hard to start jobs—refrigeration compressors, oil well pumps. etc.

★ Motors for automatic starting with low starting current, yet high starting torque, results in low cost, simplified control, less shock to the power line.

★ Motors that reduce load shocks and increase life of equipment.

★ Motors that start with smooth and gradual acceleration.

★ Motors up to 600 HP for industry — motors down to 1/100 HP for the domestic markets. The most complete line of types, by one of the largest exclusive motor specialists in the world.

• Your problem may be one of these or a different one — write today and get the help you need for correct motor application. It will save you money.

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ONE OF THE LARGEST EXCLUSIVE MOTOR MANUFACTURERS IN THE WORLD

The Cheapest, Most Practical Way To Clean Your Plant

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LOOK WHAT THESE VACUUM CLEANERS WILL DO

First of all, they ***really clean*** because dust and dirt is ***removed,*** not scattered around to resettle and damage equipment, machinery and product. The plant is virtually dust-free.

Invincibles clean all types of floors, from rough concrete to highly finished wood, and will handle practically any kind of dirt and litter except in the presence of water or oil.

Crowded, close quarters are no handicap to Invincible Vacuum Cleaners. Far from it. Invincibles clean wherever brooms can be used and a lot of places where brooms cannot reach.

Overhead cleaning of pipes, beams, walls, etc., become easy operations with Invincibles. Incidentally, with Invincibles on the job, these parts of the plant ***stay clean*** much longer.

Invincibles are invaluable for cleaning bins, shelving, motors, machinery, boiler tops, workbenches, conveyor belts, etc. If desired they may be used as efficient blowers.

Invincibles substantially decrease cleaning costs. One Invincible Operator often does the work of ***three men*** with brushes and brooms and saves an average of $2000 per year in payroll.

Last but not least, Invincibles seem virtually indestructible. Thousands of them have passed their twentieth year of continuous service. Before you say, "Vacuum cleaning is not practical for our plant," *talk to Invincible.*

INVINCIBLE VACUUM CLEANER MFG. CO.
... 440 DAVIS · DOVER, OHIO

tion of providing incentives to employers to reduce certain types of irregular employment. They show how misunderstanding of the implications of experience rating tends to arouse opposition and that opposition based on faults of legislative drafting serves only to cloud the real issue. The administrative problems in the experience-rating provisions of state laws are appraised, as well as those entailed in other proposals being considered. To remedy the differences existing among the laws of the various states, and to eliminate the possibilities of unfair competitive advantages among the states, a number of basic national standards are suggested, which, in the authors' view, should be written into the Social Security Act in order to make experience rating work properly.

REMINISCENCES OF MENLO PARK

Francis Jehl, Edison Institute, Dearborn, Mich. 450+ pages, illustrated, index. Paper cover 50c.; cloth cover $1. Mailing charges 15c. extra.

Volume II of Mr. Jehl's reminiscences of Thomas Edison, continues the biography of the Menlo Park genius as he appeared to his co-worker. Mr. Jehl covers such topics as "the world in 1880," "comments from Europe," "the Edison Electric railway and motor history," "how Westinghouse entered the electrical industry," "notable men of the period," and many others related to Edison and his work.

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ON THE CALENDAR

MAY

8–12, National Fire Protection Association, Annual Meeting, Chicago. Franklin H. Wentworth, Managing Director, 60 Batterymarch St., Boston.

22–25, National Association of Purchasing Agents, Annual Meeting, San Francisco. G. A. Renard, Secretary, 11 Park Place, New York.

JUNE

13–16, Smoke Prevention Association, Thirty-third Annual Convention, Milwaukee. Frank A. Chambers, Secretary-Treasurer, 139 North Clark St., Chicago.

26–29, National Association of Cost Accountants, Annual Meeting, Atlantic City. S. C. McLeod, Secretary, 385 Madison Ave., New York.

26–30, American Society for Testing Materials, Annual Meeting, Atlantic City. C. L. Warwick, Secretary-Treasurer, 260 South Broad St., Philadelphia.

JULY

2–5, American Society of Heating & Ventilating Engineers, Semi-annual Meeting, Mackinac Island, Mich. A. V. Hutchinson, Secretary, 51 Madison Ave., New York.

10–14, American Society of Mechanical Engineers, Semi-annual Meeting, San Francisco. C. E. Davies, Secretary, 29 West 39th St., New York.

UNIVERSITY SUMMER COURSES FOR EXECUTIVES AND ENGINEERS

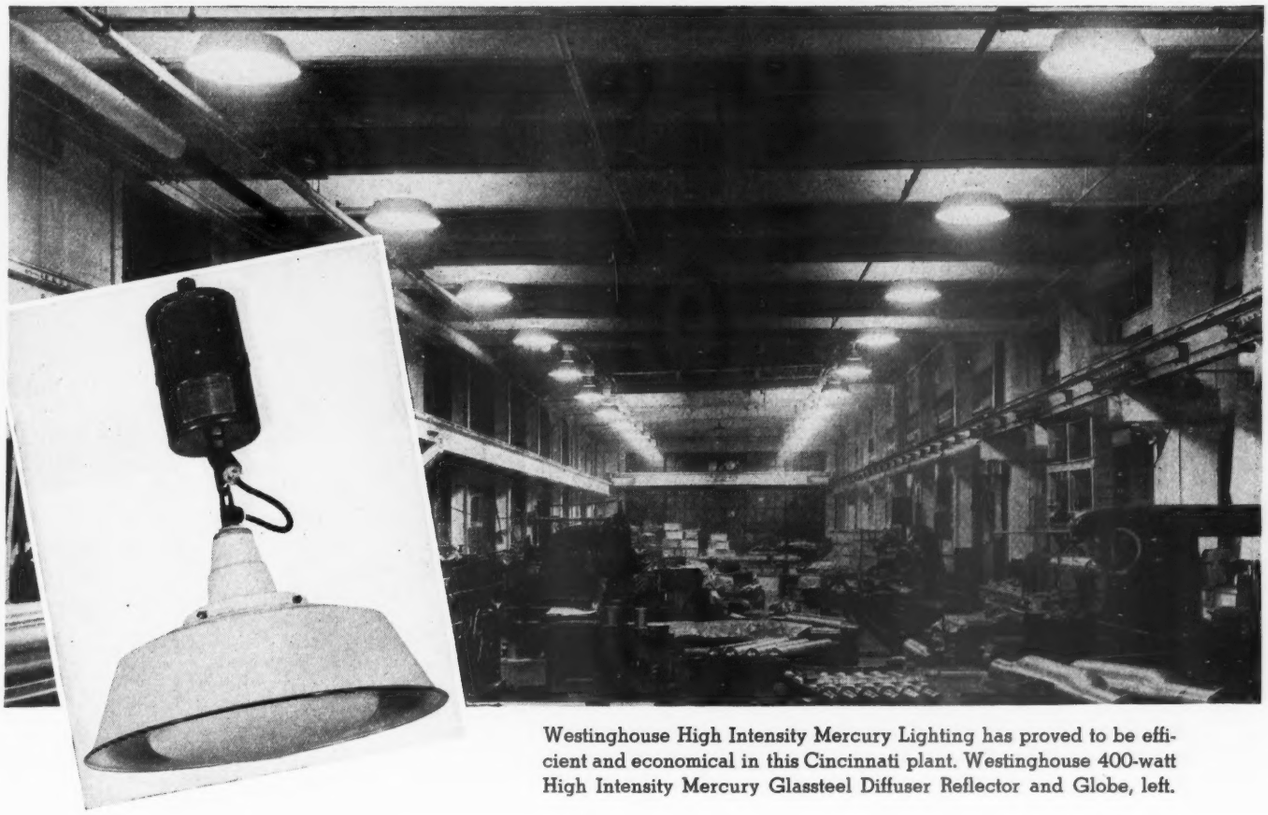
June 5–17, Course in Statistical Methods for Quality Control, Massachusetts Institute of Technology. H. A. Freeman, Department of Economics, Massachusetts Institute of Technology, Cambridge, Mass.

June 12–30, Summer Management Course, including special work in motion and time study, University of Iowa, Iowa City. Ralph M. Barnes, 107 Engineering Bldg., University of Iowa, Iowa City.

June 24–July 3, Ninth Annual Economics Conference for Engineers, Stevens Institute of Technology and Management Division of The American Society of Mechanical Engineers, Stevens Engineering Camp, Johnsonburg, N. J. Prof. George W. Barnwell, Stevens Institute of Technology, Hoboken, N. J.

Rx H.I.M. Prescribed

FOR BETTER INDUSTRIAL SEEING



Westinghouse High Intensity Mercury Lighting has proved to be efficient and economical in this Cincinnati plant. Westinghouse 400-watt High Intensity Mercury Glassteel Diffuser Reflector and Globe, left.

High Intensity Mercury Lighting is *prescribed* for industrial plants where close-seeing is a major production factor. It is *more efficient* and *more economical* . . . it produces more light of better quality at less cost.

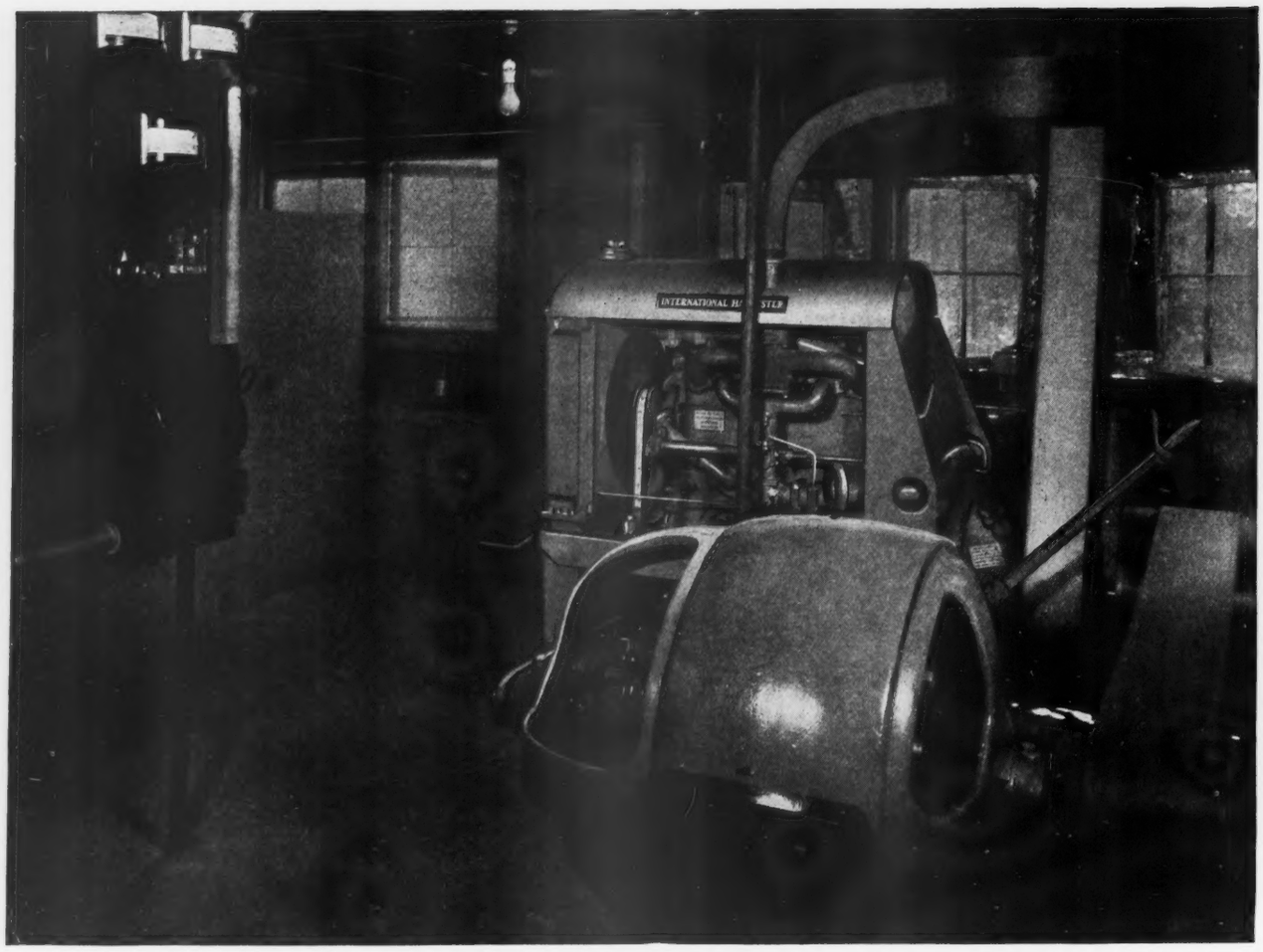
High Intensity Mercury is a "remedy" that can aid in increasing accuracy of workmanship, speeding the rate of production and reducing accidents.

Proper lighting equipment and careful engineering play a primary role in High Intensity Mercury Lighting systems. Westinghouse offers both; and accepts undivided responsibility by offering a complete line of High Intensity Mercury equipment, including reflectors, transformers, lamps and accessories. Skilled Westinghouse lighting engineers are at your service without charge to analyze your plant lighting and to prescribe for its improvement.

Call your nearest Westinghouse Distributor for full details; or write Westinghouse Electric & Mfg. Co., Lighting Division, Edgewater Park, Cleveland, Ohio.

Westinghouse Lighting Equipment

CUTTING POWER COSTS IN FACTORIES



An International P-30 Power Unit operating the line shaft and a generator in a plant manufacturing casket hardware. It is making important savings in this plant compared to the power formerly used.

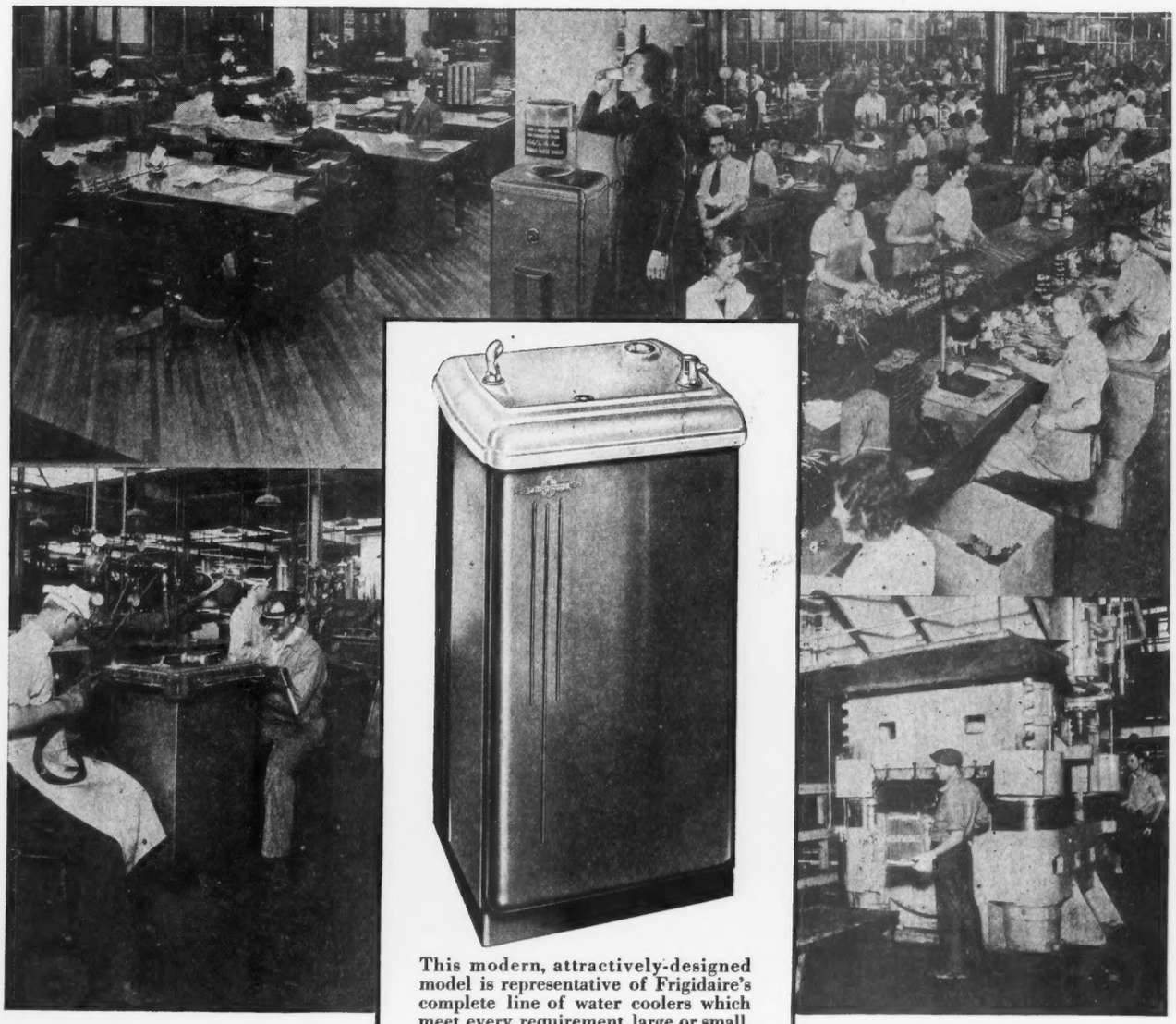
International Power Units save money many ways when they are installed on the job. The sound engineering and quality construction that go into these engines pay dividends in low operating and maintenance costs and long engine life. When you put an International Engine on the job you can bank on economical efficiency. They are available in eleven different models (gasoline, gas, and Diesel), ranging up to 110 max. h.p. When more power is needed, two or more can be installed and operated at important savings. Turn the economy of International Power into profits for your business. Ask the nearby International industrial power dealer or Company-owned branch for complete information.

INTERNATIONAL HARVESTER COMPANY

(Incorporated)

180 North Michigan Ave. Chicago, Illinois

INTERNATIONAL Industrial Power



This modern, attractively-designed model is representative of Frigidaire's complete line of water coolers which meet every requirement, large or small.

PAYING PROFITS TO EVERY TYPE OF INDUSTRY!

Modern Frigidaire Water Coolers Increase Employee Safety and Efficiency . . . Build Good Will . . . and Pay for Themselves in Savings!

■ Every day, an increasing number of America's industrial plants are finding it pays dividends to replace obsolete water cooling systems. They're modernizing with new Frigidaire Water Coolers—and finding it an investment in employees' safety and efficiency . . . in greater employee goodwill . . . and a sensational saving over old-style methods.

For Frigidaire's outstanding line of industrial water coolers is built to not only do a far superior water cooling job, but to do it at *lower operating cost!* Actual figures prove that, in almost every instance, the savings effected by the installation of modern Frigidaire Coolers were great enough to pay replacement cost in a short period of time. And working conditions were vastly improved—the number of accidents cut—production stepped up!

Get full facts today about the savings and advantages a system of modern Frigidaire Water Coolers can bring to your plant or factory! No matter what your requirement, there is a Frigidaire model to meet it. See the "Water Coolers" section of your Classified Telephone Directory for the location of your nearest Frigidaire Dealer. Or write: Frigidaire Commercial Division, General Motors Sales Corporation, Dayton, Ohio.

Coolers for Private and General Offices, Theatres, Clubs, and Every Type or Size Industrial Plant.

FRIGIDAIRE WATER COOLERS

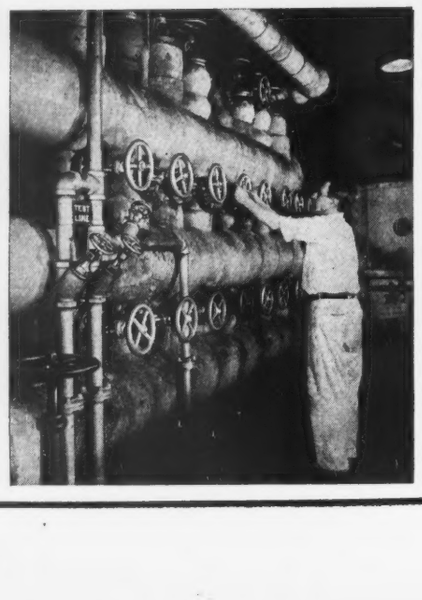
Made Only By General Motors

Top-Quality JENKINS iron VALVES

SERVICE RECORD CHECKED BY INDEPENDENT ENGINEERS*

Above:—*This 16" Jenkins Iron Globe serves main steam line to vacuum pans—opened and closed at least 12 times a day, without even a disc replacement in the last 7 years.*

Below:—*Each vacuum pan which boils and crystallizes "liquor" into sugar, uses 72 large Jenkins Iron Valves. Installed in 1898—still going strong.*



24-HOURS-A-DAY operation is the rule at National Sugar Refining Co.'s Long Island City plant. Their original installation, built in 1898, is still a part of this modern 12 story refinery.

Here we find hundreds of Jenkins Iron Valves giving trouble-free service after 41 years!

This verified performance record is typical of the service you can expect from Jenkins Iron Valves. It offers concrete proof that the best in Iron is also the cheapest in the long run . . . for Jenkins Iron Valves cost no more!

JENKINS BROS., 80 White St., New York, N.Y.; Bridgeport, Conn.; Boston; Atlanta, Ga.; Philadelphia, Pa.; Chicago, Ill.; Houston, Texas; Montreal, Canada; London, Eng.

**Anderson Nichols, Associates, New York*

1864 REG. U.S. PAT. OFF. TRADE JENKINS MARK 1939

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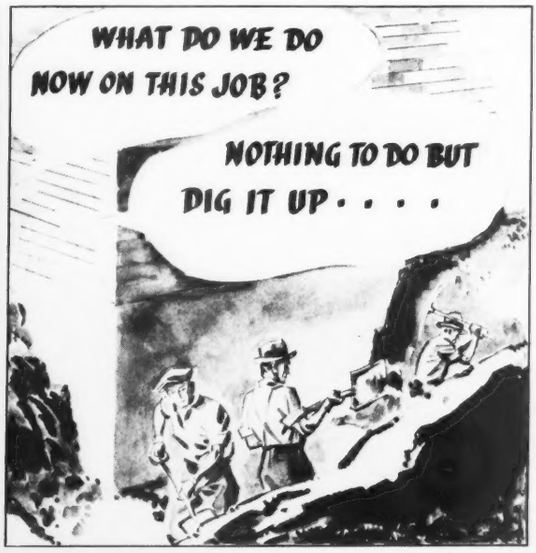
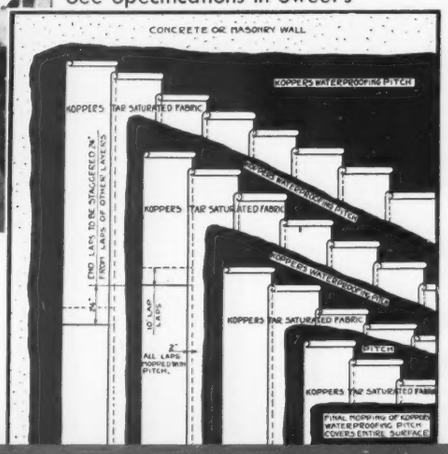
DIAMOND ANNIVERSARY

KEEP OUT WATER WITH KOPPERS COAL TAR WATERPROOFING ★



LET'S STICK TO KOPPERS WATERPROOFING

See Specifications in Sweet's


CONCRETE OR MASONRY WALL
KOPPERS WATERPROOFING PITCH
KOPPERS TAR SATURATED FABRIC
KOPPERS WATERPROOFING PITCH
KOPPERS TAR SATURATED FABRIC
KOPPERS WATERPROOFING PITCH
KOPPERS TAR SATURATED FABRIC
PITCH
KOPPERS TAR SATURATED FABRIC
FINAL MOPPING OF KOPPERS WATERPROOFING PITCH COVERS ENTIRE SURFACE
END LAPS TO BE STAGGERED 24" FROM LAPS OF OTHER LAYERS
24"
10" LAP
2" ALL LAPS MOPPED WITH PITCH

OTHER KOPPERS PRODUCTS: Koppers Roofing . . . Dampness Resisting Paints . . . Bituminous-base Paints . . . Tarmac for paving drives, walks, parking areas, etc. . . . Disinfectants . . . Insecticides . . . Deodorants.

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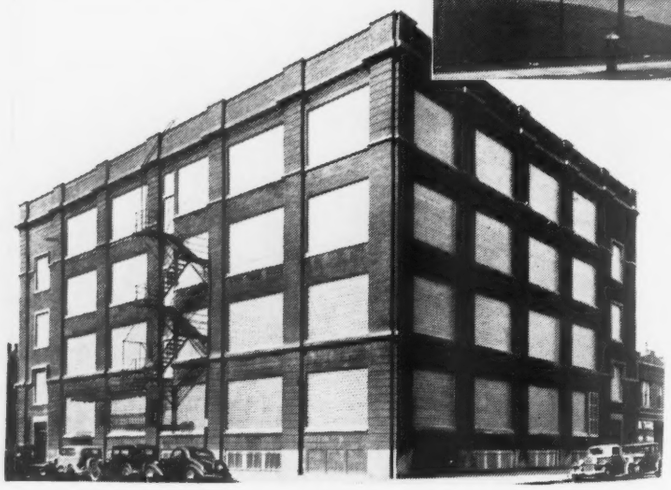
KOPPERS COMPANY · PITTSBURGH, PA.

KOPPERS product

TIME TO REMODEL WITH INSULUX

CUT DOWN
Maintenance Costs

STEP UP
Manufacturing Efficiency



● Bristol-Myers Company, Hillside (New Jersey) factory, Wigton-Abbott Corporation, New York, N.Y., Engineers and Contractors.
Bristol-Myers remodeled with Insulux for a variety of reasons: 1) To safeguard cleanliness; 2) To make their factory an effective 24-hour advertisement; 3) To decrease maintenance; 4) To help air conditioning.

● Oscar Heineman Corporation, Raw and Thrown Silk, Chicago, Illinois.
When modernizing, Oscar Heineman adopted Insulux to reduce condensation and to cut maintenance costs.

● A few minutes' study will convince you that Owens-Illinois Insulux Glass Block is the ideal industrial building material. Dig deeper and you will discover that you can use Insulux on your present budget.

Accurate records prove that Insulux can be erected at a square foot cost comparable to commonly used wall materials. It permits definite savings because it combines wall and window into a single unit.

Insulux is the key to lower maintenance costs. There's no painting. Just clean it occasionally and forget it.

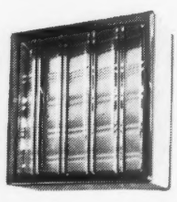
Install an Insulux test panel in your own plant. Its cost is small; its results significant. One panel permits you to inspect actual construction methods, to verify our claims, to prove to yourself that Insulux is tailor-made for your operation.

Look at its many advantages. A wide selection of face designs allows you to secure almost any desired degree of light transmission from 41 to 86.5 percent. Excellent insulating properties. Reduced condensation. More efficient air conditioning. Improved working conditions through better lighting.

More than 50,000 Insulux jobs are now on record. Ask our architectural department for more details on test panels. Owens-Illinois Glass Company, Insulux Products Division . . . Toledo, Ohio.

VISIT THE GLASS CENTER 1939 NEW YORK WORLD'S FAIR

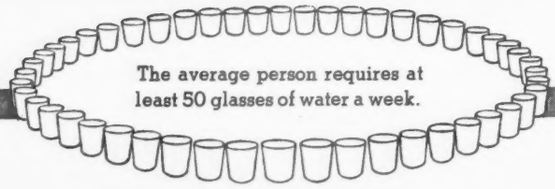
OWENS · ILLINOIS
INSULUX



FIRST IN GLASS
GLASS BLOCK

FOR amazing economy use Disston Di-Mol Hack Saw Blades. They withstand trying speeds and feeds developed in machine sawing. They need no coddling in the hands of shop men. Uniformity, quality, value, are assured by the Disston name on orange band on blade. Try Di-Mol on special steels, modern alloys, castings. Standard teeth, lengths, widths, thicknesses. Hand blades, ½ gross in box. Machine blades, 1 dozen. Henry Disston & Sons, Inc., Philadelphia, U. S. A.

ORDER FROM YOUR DISTRIBUTOR OF DISSTON DI-MOL BLADES



STAINLESS STEEL TOP

...BEAUTY CURE FOR BREAKAGE COSTS

Enduring beauty that pays double dividends. That's the practical moneysaving story of the Stainless Steel Top . . . exclusive feature of Westinghouse Water Coolers. First, their clean, sanitary, attractive appearance encourages normal, healthful drinking. Second, they are unbreakable and chip-proof . . . eliminating a real expense hazard.

Other Exclusive "PLUS VALUE" Features

Special Capacity Booster . . . High Efficiency Cooling Chamber . . . Built-in Watchman Protection . . . Permanent Oil Supply . . . Burnout-Proof Motors . . . Hermetically-sealed Mechanism.

No grit, dirt, rust or corrosion . . . the things that cause most machinery to wear out, can harm the Westinghouse mechanism because it is Hermetically-sealed inside an airtight case of solid steel.

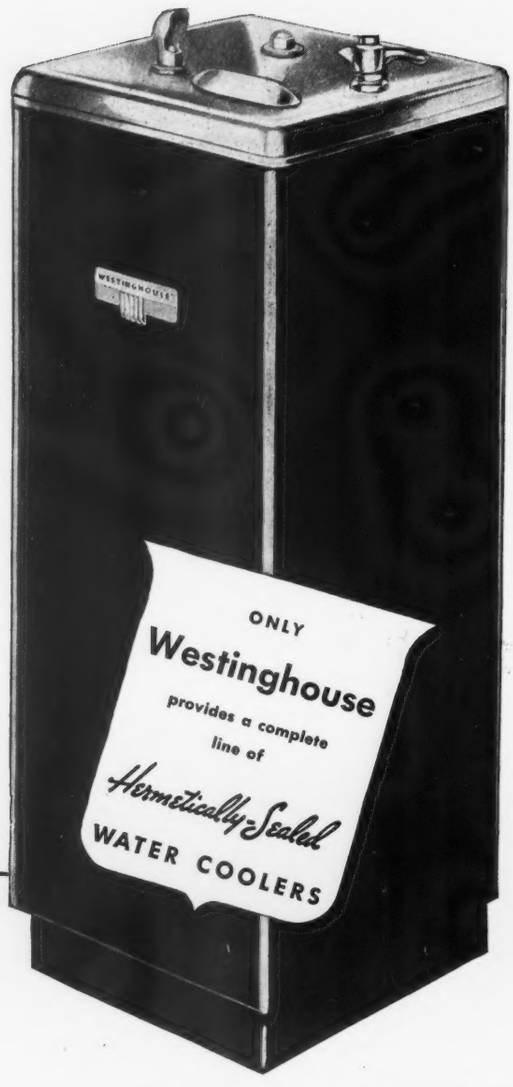
Because it is Hermetically-sealed, Westinghouse provides a plan for five year's protection on the sealed-in mechanism. This is based on the EXTRA years of trouble-free performance which experience shows you can confidently expect.

• • •

Westinghouse

WATER COOLERS

Explosion-proof models available



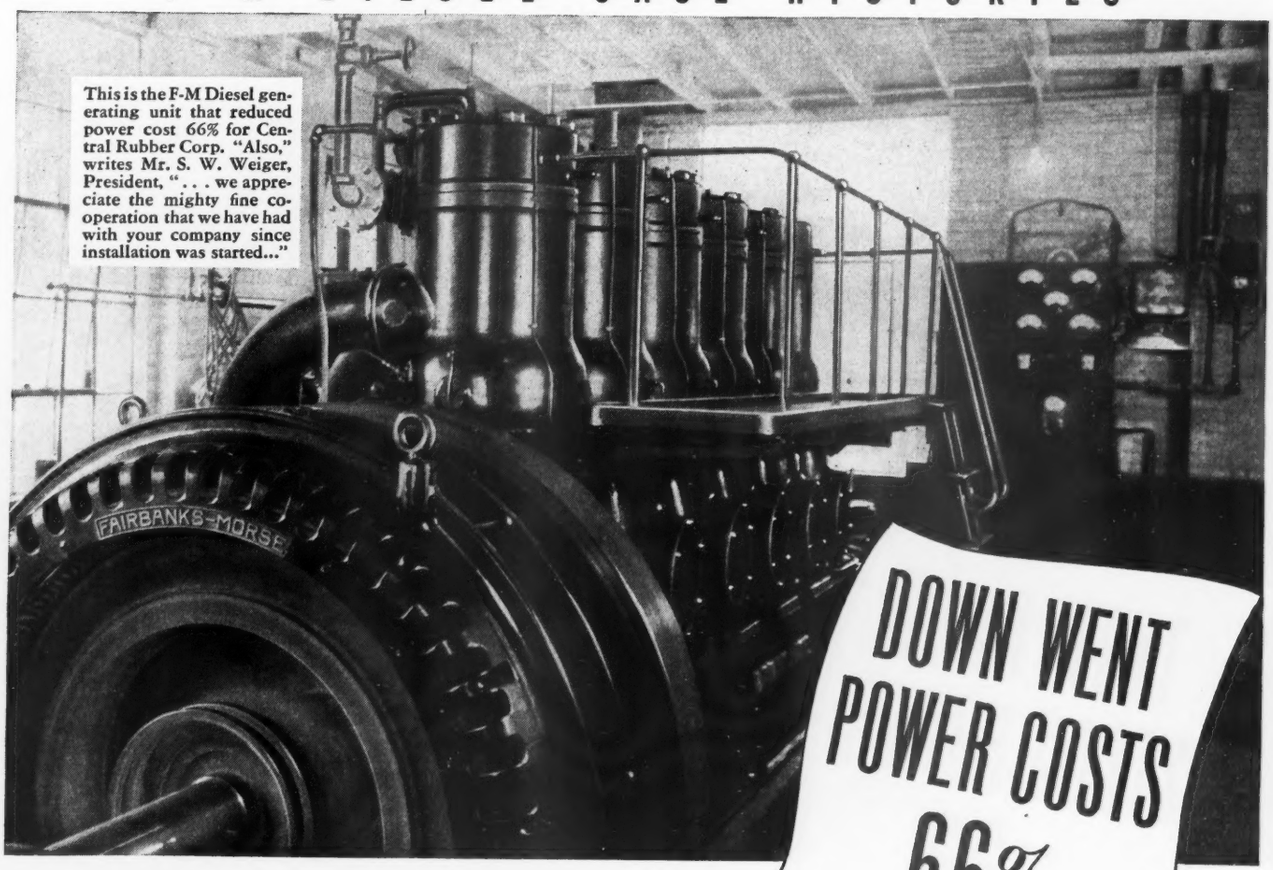
FREE. Ask your Westinghouse dealer for free copy of a useful folder—"How to Check Drinking Water Costs" or mail this coupon to—Westinghouse Electric & Manufacturing Company, Section 9047, Mansfield, Ohio.

NAME_____

ADDRESS_____

CITY_____ STATE_____

F - M DIESEL CASE HISTORIES



This is the F-M Diesel generating unit that reduced power cost 66% for Central Rubber Corp. "Also," writes Mr. S. W. Weiger, President, "... we appreciate the mighty fine cooperation that we have had with your company since installation was started..."

DOWN WENT POWER COSTS 66%

F-M Diesels Exceed Expectations of Central Rubber Corp., Findlay, Ohio

POWER COSTS were a problem with the Central Rubber Corporation of Findlay, Ohio—*but not now.* Several years ago, unable to lower the cost of purchased power, this company installed a 450-horsepower Model 32 Fairbanks-Morse Diesel engine and a 300-kilowatt alternator. Down went power costs—*66 per cent*—considerably more than conservative Fairbanks-Morse engineers promised. In addition, the plant no longer needs to shut down during an electrical storm to avoid danger of burning out its big electric motor. It is not penalized for peak demands or low kilowatt-hour consumption.

A two-thirds reduction in power cost is a worth-while saving. Why not investigate what *Diesel Headquarters* can do for you? Write Fairbanks, Morse & Co., Dept. 30, 600 S. Michigan Ave., Chicago, Ill. Branches and service stations throughout the United States and Canada.

When it's even too hot for a Hottentot, *COMFORTIZE* with an F-M Room Cooler.

7527-OA40.152

FAIRBANKS MORSE Diesels

DIESEL ENGINES
PUMPS
ELECTRICAL MACHINERY
FAIRBANKS SCALES
RAILROAD EQUIPMENT
WATER SYSTEMS
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SUN-SCORCHED? No Sir!
It's SUN-PROTECTED!
The gravel or slag wearing surface of a Barrett Specification Roof does more than guard the roof membrane against fire and mechanical damage.
It provides positive protection against the sun's harmful actinic rays. It also permits the use of greater quantities of coal-tar pitch—the world's greatest built-up roofing compound. Pitch is actually preserved by water.
These are reasons why Barrett Specification Roofs laugh at conditions that spell trouble for most other roofs. Applied only by Barrett Approved Roofers according to time-tested Barrett Specifications, these famous roofs are bonded for 20 years, and regularly outlast their bonds by decades.
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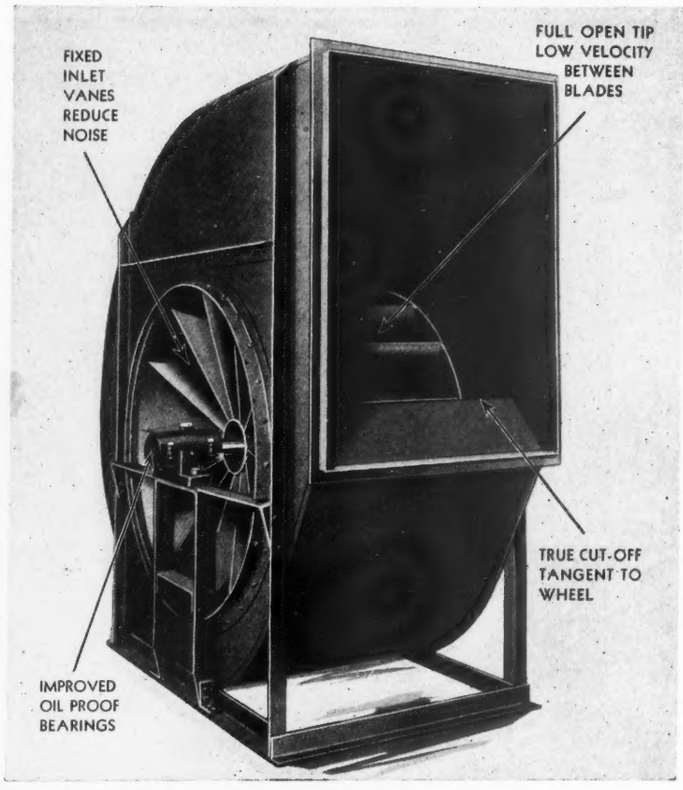
40 Rector Street, New York, N. Y.
2800 So. Sacramento Avenue, Chicago, Illinois Birmingham, Alabama
In Canada: The Barrett Company Ltd., Montreal, Que.
The nearest Barrett Approved Roofer may be found in the Classified Telephone Directory under "Roofers."
*Trade-mark of The Barrett Co., Reg. U. S. Pat. Off.
Our Roof Inspection Service will gladly give you a complete authoritative report on the condition of your present roof. There is no cost or obligation. Write our nearest office.
Barrett Specification* Roofs
AMERICA'S LEADING MANUFACTURER OF COAL-TAR PRODUCTS • ROOFINGS • TARVIA • CHEMICALS

For QUIET AIR CONDITIONING


FIXED INLET VANES REDUCE NOISE
FULL OPEN TIP LOW VELOCITY BETWEEN BLADES
TRUE CUT-OFF TANGENT TO WHEEL
IMPROVED OIL PROOF BEARINGS

USE "Buffalo"

LIMIT-LOAD FANS

There are good fan engineering reasons why Buffalo Limit-Load Conoidal Fans operate so quietly and so free from troublesome and expensive maintenance costs.

—Inlet vanes are fixed providing not only quiet but most efficient operation.

—Wheels are our own special design with wider and deeper curved blades.

—Housings are smooth—no bolts or rivets to create turbulence.

—Casing extends out beyond the scroll development of housing far enough for a *true* cut-off.

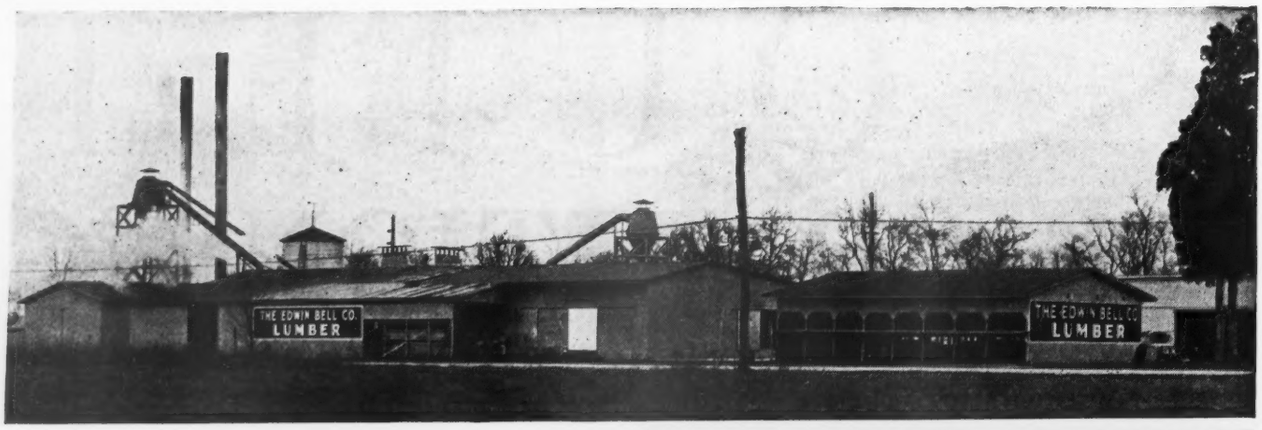
—Tangent off the wheel coincides with the flare at cut-off, insuring equal air flow over entire outlet.

Yes, if you want truly quiet ventilation and air conditioning, you can have it by installing Buffalo Limit-Load Fans.

Send for New Bulletin

Contains important data that every heating and ventilating engineer should have. Please ask for Bulletin 2966-C.

BUFFALO FORGE COMPANY
471 BROADWAY **BUFFALO, N. Y.**
Branch Engineering Offices in Principal Cities
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.



Thermoid

TRANSMISSION BELTS

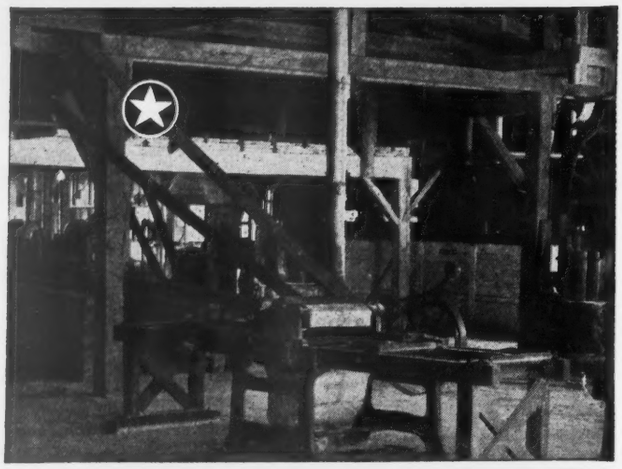
Both a Lot Older Than They Look ★

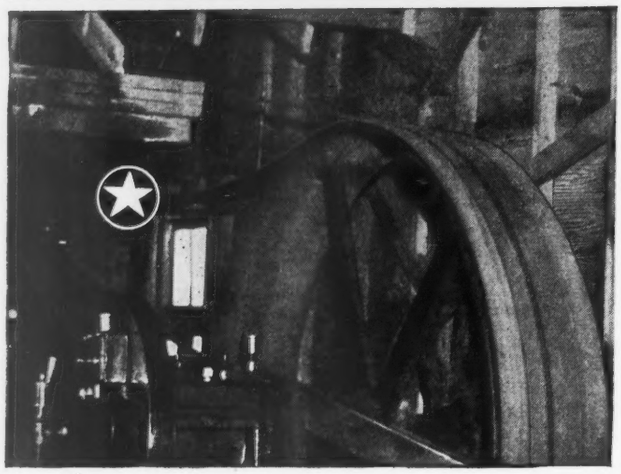
The Edwin Bell Company of Vienna, Maryland, has a widespread reputation for the excellence of its millwork. It naturally follows that their equipment is kept in the finest condition, and that they are particular about the products they use in their plant.

"Starred" in the illustrations are two Thermoid Transmission Belts which they purchased from L. W. Gunby Co. of Salisbury, Maryland. The smaller belt runs at high speed under full tension. The larger belt carries a planned slack of 3 to 4 feet without slippage under extremely heavy load. Both of these belts have been in continuous daily service for over two and a half years . . . but in the experienced judgment of the plant superintendent *neither looks as if it had been in service for more than a month!*

Thermoid users who read this will not be surprised. They know that service and performance like this are the rule with Thermoid Products, because they are carefully engineered and built for the job they have to do.

If you need transmission belting, or any other industrial rubber product, it will pay you to get from your jobber all of the facts on the Thermoid Product for your particular service.





More than half a century of progressive engineering and product development.

THERMOID RUBBER, DIVISION OF THERMOID COMPANY, TRENTON, N. J.

Standard types of belting made by Thermoid:
Transmission Belting
Conveyor Belting
Multiple V Belts
Grader Belting
Canners' Belting
Bucket Elevator Belting

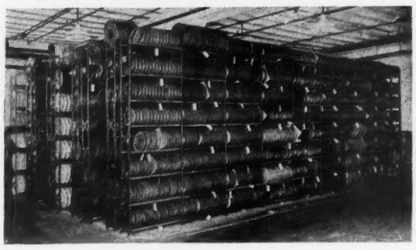
Thermoid

Standard types of hose made by Thermoid:
Air Hose
Water Hose
Steam Hose
Tank Truck Hose
Gasoline Hose
Suction Hose

BELTING · HOSE · PACKINGS · BRAKE LININGS

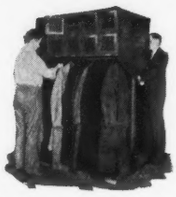
HERE'S HOW

High in Efficiency—Low in Cost



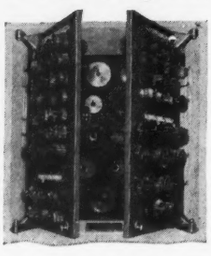
Accompanying illustration shows how the complicated problem of storing backing plates for brakes was solved for a manufacturer of automobile accessories without any extra cost for designing and building special storage equipment. While the closely nested sections of backing plates subjects the racks to tremendous weight, Lyon standard rack equipment proved strong enough to permit racking the stock ceiling high.

A New Economical Method of Clothes Storage



The Lyon Shoprobe has proved itself an exceptionally practical solution to the employee clothes storage problem in a great variety of manufacturing plants and commercial institutions. Made in two sizes, it accommodates 10 to 20 persons in a very minimum of floor area. Each person has a private compartment, fitted with padlock attachment, for hats, tools and personal belongings . . . and an individual coat hanger with chain to run through sleeve for padlocking coat at the same time locker is locked.

Safe Storage for Milling Cutters



Lyon Insert No. 13-4, illustrated above, provides efficient storage for milling cutters and similar tools which can be hung on pegs. Consists of one back panel 34½" wide, 37¾" high; and two swinging panels 17½" wide, 36½" high. Swinging panels are double face to provide storage area on both sides. Panel and doors punched every inch for adjustment of pegs and check hooks, providing approximately 27 square feet of panel storage space.

Lyon Surveys Disclose Space-Saving and Production-Accelerating Opportunities in Many Industries

What a systematic check-up on storage and materials handling methods may mean to any industrial or commercial organization is demonstrated by the following typical cases.

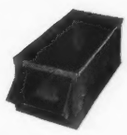
What's New?

Endorsed by health authorities as an efficient means of reducing the hazards of communicable diseases in factory or office . . . Lyon's new SHOWERWAY provides a quick, 100% sanitary method of hand washing. Its sanitary features recommend it particularly for factory, first aid stations, food manufacturing plants and cafeteries.

The Showerway, which is entirely self-contained, gives a new mobility to lavatory fixtures . . . can be placed wherever desired without structural expense. For this reason, it saves steps and time for office and factory workers, while protecting them from the contact hazards of unsanitary wash bowls.

The hands touch only one part of Showerway . . . the soap plunger, which cleans itself with each operation, a slight pressure on the foot pedal *showers* warm water down on the hands. There are no drain plugs in the Showerway bowl. The water runs away as used — the showering action of the water keeping the bowl clean. A thorough sanitary hand wash is complete in 15 seconds.

New Two-Purpose Shop Container



Known as Style "RB," this heavy duty shop container provides a strong stacking box for the transportation of small parts from one operation to the next; or it may be stacked on floor and used for regular stock storage. Open hopper end permits the easy removal or loading of material from any one box without disturbing the stock. Stacking rail on two sides and rear of box holds loaded boxes together in a rigid stack.

The front cross member acts as a separating member. holding top front of box in perfect alignment and serves as a convenient, strong and easily gripped handle.

New Case Storage System Cuts Space Needs 50%

Prior to a survey of a mid-western manufacturer's storage methods by Lyon engineers, he was utilizing two complete buildings for the storage of an essential stock of cases carried in two sizes—20 x 20 x 56" and 24 x 24 x 56"—and weighing 275 lbs. and 325 lbs. respectively. By the use of standard Lyon shelving, equipped with special rollers inserted in malleable castings, the complete stock is now stored in one building. Cases are stored 5 high along the wall and adjacent to it. In the center of the building the 24 x 24 x 56" cases are stored 6 high and the 20 x 20 x 56" cases 6 and 7 high. To facilitate the handling of these heavy cases, portable lift trucks are used.

Rubber Company Saves $5,000 Through Storage Survey

A large rubber company, which recently modernized its mold storage room in accordance with recommendations based on a Lyon storage survey, reports that immediate savings more than covered the cost of the new storage equipment involved. Floor space released for manufacturing purposes, and savings in man-hours made possible by the more efficient facilities for handling the heavy molds in and out of storage, will, according to this manufacturer's own estimate, provide annual savings of well over $5,000.

LYON *Service*

STORAGE EQUIPMENT

LYON METAL PRODUCTS, INCORPORATED, *Aurora, Illinois*

LYON METAL PRODUCTS INCORPORATED
1205 River Street, Aurora, Ill.

Please send full details on:

☐ Showerway ☐ Insert No. 13-4 ☐ Shoprobe
☐ "RB" Two-purpose Shop Box ☐ Storage Survey Service.

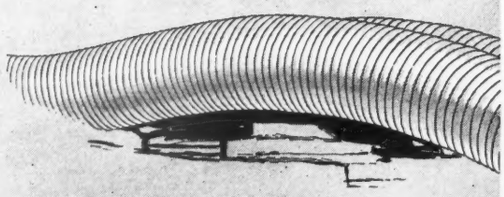
Name _____

Address _____

City _____ *State* _____

WHEN YOU THINK OF

Versatility



YOU THINK OF

METAL

Let Versatile

Flexible METAL Hose and Tubing help you to solve such problems as these.

- The problem of CONVEYING steam, liquids, gases . . . under pressure . . . at high or low temperatures . . . to moving machine parts, to portable equipment . . . for either temporary or permanent connections.

- The problem of ABSORBING VIBRATION where rigid connections would leak, fail or transmit undesirable noise . . . and yet to provide all the permanence and positive character of a continuous METAL connection.

- The problem of CONNECTING moving parts to sources of supply for oil, steam or process liquids . . . with a tight, trouble-free, mechanically correct connection, **designed** for movement rather than "adapted" to movement.

- The problem of SAFETY where high temperatures, pressures or the dangerous nature of liquids or gases being handled demands a connection that is as dependable as is humanly possible under prescribed conditions . . . that has the inherent fire resistance and physical strength of METAL.

Such problems quickly yield to Flexible METAL Hose and Tubing specifications.

SEND FOR YOUR COPY
of the Institute "FACT BOOK"

It shows how and why such problems as those outlined here can be solved surely and at low cost by using the widely applicable Flexible METAL principle of hose and tube construction. It is free Send for your copy.

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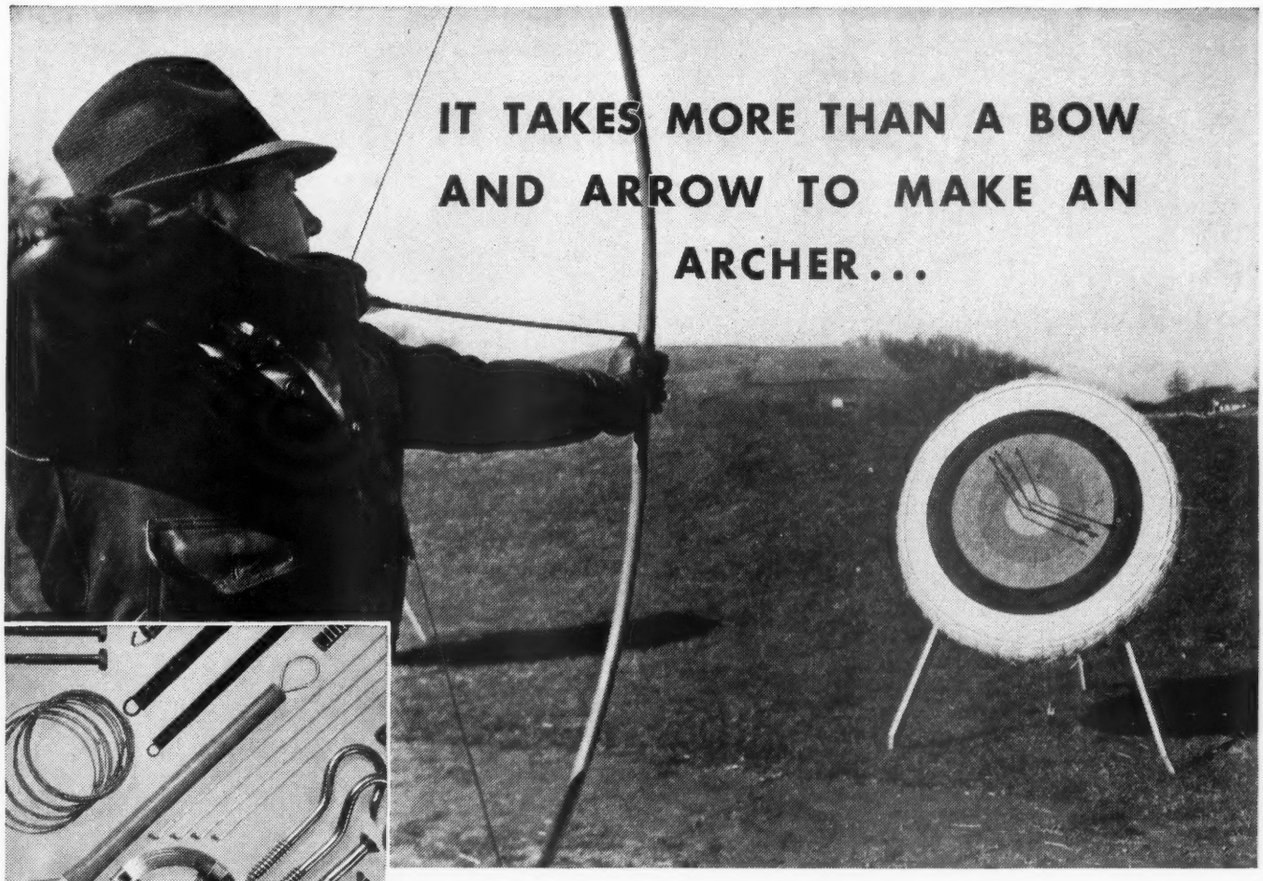

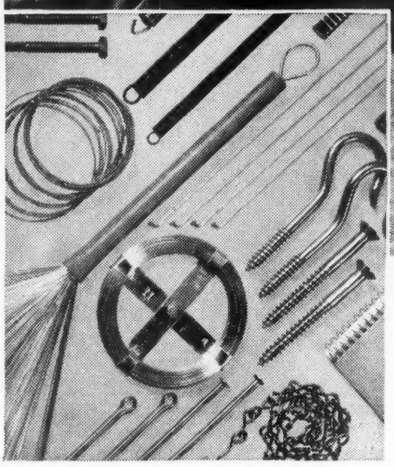

Premier Spring Wire · Weaving Wire · Pin Wire · Bolt, Rivet and Screw Wire · Broom and Brush Wire · Pinion Wire · Basic and Bessemer Screw Stock · Premier Tested Welding Wire · Flat Nut Stock · Hair Pin Wire · Mattress Wire · Music Spring Wire · Piano Wire · Amercut Cold Finished Steel Bars · Pump Rod Bars · Wool Wire · Wire Rods · Also U·S·S Stainless and Heat-Resisting Wires

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IN every walk of life it is true that ability and experience produce skill. And these factors are certainly important in the making of wire.

There are more than 160,000 recorded uses for wire and each particular use has its own specific requirements. We have been in the business of making wire for over 100 years. In that time most of the problems of wire making have come to our attention and we have been successful in solving them.

If you have a problem involving wire we will be glad to help you work it out. You will find that American Quality Wire is a product that has been produced with the greatest skill and care.

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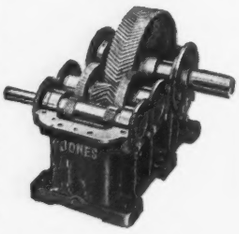
UNITED STATES STEEL

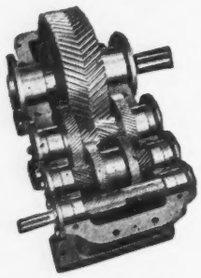
SINGLE! DOUBLE! TRIPLE!

—every type of Herringbone Speed Reducer that you might need

Single Reduction
Type SH



Double Reduction
Type DH



Triple Reduction
Type TH

JONES Herringbone Gear Speed Reducers are built in a wide range of ratios and ratings to cover every requirement. Single (Type SH) reducers in standard ratios range from 1.25 to 1 up to 11 to 1 in ratings from 1.3 to 440 H.P. Double (Type DH) reducers are built in standard ratios from 10.9 to 1 up to 72 to 1 in ratings from 0.5 to 275 H.P. The triple reduction reducers (Type TH) cover a range of ratios from 86.9 to 1 up to 355.8 to 1 in ratings from 0.3 to 78 H.P.

All these reducers have heat treated gears, ground shafts and are mounted with anti-friction bearings throughout. Cast iron bases are available for all variations of motor assembly. Liberal stocks are carried to facilitate shipments.

W. A. JONES FOUNDRY & MACHINE CO.
4433 Roosevelt Rd., Chicago, Ill.

HERE'S THE LATEST INFORMATION

about the application of Herringbone Reducers

This new 128-page catalog of Jones Herringbone Reducers presents a vast amount of data relating to Herringbone Reduction Units. Illustrations show a broad range of herringbone reducer applications and the technical information shows how to select reducers for all conditions of service in accordance with the A.G.M.A. recommended practice.

Write for your free copy of this valuable treatise

Since 1890

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HERRINGBONE — WORM — SPUR — GEAR SPEED REDUCERS
CUT AND MOLDED TOOTH GEARS — V-BELT SHEAVES
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FRICTION CLUTCHES AND TRANSMISSION APPLIANCES

ANCHOR FENCES Stay in Line

Anchor Fences give *permanent* protection against trespassers, trouble-makers; help organize plant traffic. They always stand straight and true because their deep-driven "anchors" spread out under ground and keep the posts permanently in line.

For nearly half a century, industrial organizations have relied on Anchor Fences and the skill of Anchor's Nation Wide Erecting Service for the solution of countless industrial fencing problems. Write today for Anchor Manual and address of nearest Branch Office.

(Above) Anchor Chain Link Fence protecting industrial property. Anchor's complete line of fences and gates also includes Iron Picket Fences for all industrial purposes.

FREE ANCHOR FENCE MANUAL

Write today for Anchor Industrial Fence Manual containing ideas, specifications, that will help you solve your fence problems.

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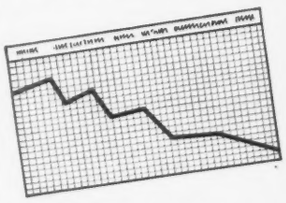
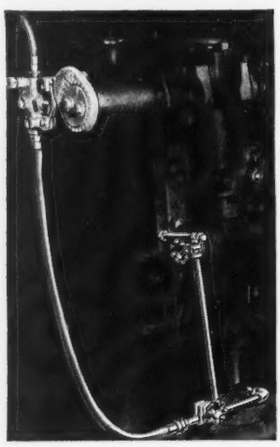
IRON PICKET
for Every Purpose

AIR
"KNOCK-OUT" SETS





REDUCE PRESS WORK COST . . .

Timed air blasts remove finished work from presses without an instant of lost time or motion and with complete safety to the operator. Complete Schrader Air Ejection Sets for cam or ram operation, are adaptable to practically every type of machine. Easy to install. Available through all mill supply distributors.

Send for a copy of catalog No. 305 showing "Ejection Sets" and other Schrader Air Products.

Schrader

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A. SCHRADER'S SON Dept. FMM **BROOKLYN, N. Y.**
Division of Scovill Manufacturing Company, Incorporated

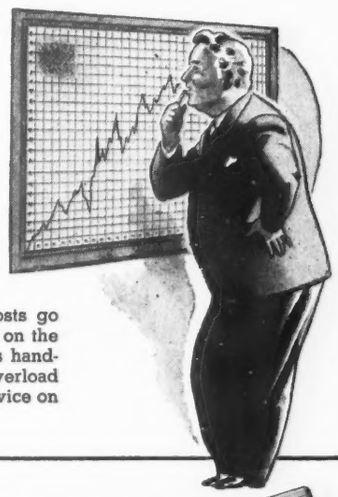
How to Make an Hour out of 40 Minutes

A neat trick *(and you can do it!)* with the

Thor U44

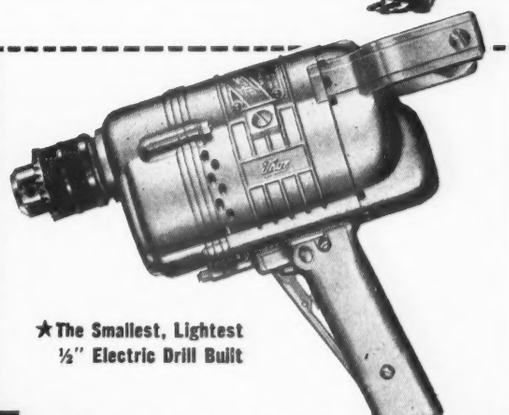
Half-Inch Drill

"THERE'S MAGIC IN IT!" users marvel, "the way we do more work in *less time* with the new Thor U-44. But, the explanation is simple — the small size and light weight of this half-inch drill reduces operator fatigue. Men do better work . . . *faster.*



PRODUCTION RISES, while costs go down . . . when a Thor U-44 goes on the job. It's a heavy-duty drill and its hand-formed motor provides greater overload capacity to assure dependable service on the hardest work.

DRILL USERS BEAM! *"Half* the weight, in *half* the space," they say, "That's the reason we want the Thor U44. It's smaller . . . lighter, with extra power for production drilling, *plus* greater handling ease for maintenance work."



★The Smallest, Lightest ½" Electric Drill Built

Thor offers more!

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PORTABLE ELECTRIC TOOLS

USE THIS COUPON NOW

Independent Pneumatic Tool Co.
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● Please send me full details and price on the Thor U44 half-inch drill.

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SCOTCH ADHESIVE TAPES

- Pressure Sensitive
- Seal Without Moistening

WRITE FOR SAMPLE ROLL

Thousands of successful manufacturers are now using Scotch Adhesive Tapes to simplify production—saving time—saving materials and in many cases, improving the products.

Over 50 Scotch Adhesive Tapes are made in crepe or flat backings of paper, cloth, fibre or acetate film with varying thickness and strength, and a wide range of adhesive properties to meet your specific requirements.

Don't hesitate trying this production short cut. Write for a sample roll of Scotch Adhesive Tape today stating intended use.

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sizes and types offered by Finnell for *Low-Cost Floor Maintenance*—each an ALL-FINNELL-CONSTRUCTED product throughout, designed to meet specific needs.

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FINNELL SYSTEM, Inc.
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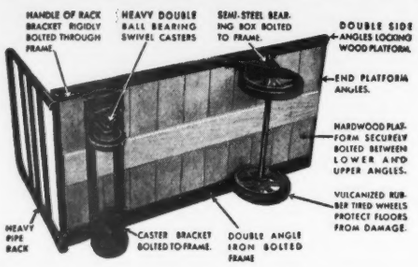
HANDLE OF RACK BRACKET RIGIDLY BOLTED THROUGH FRAME
HEAVY DOUBLE BALL BEARING SWIVEL CASTERS
SEMI-STEEL BEARING BOX BOLTED TO FRAME
DOUBLE SIDE ANGLES LOCKING WOOD PLATFORM
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HARDWOOD PLATFORM SECURELY BOLTED BETWEEN LOWER AND UPPER ANGLES.
VULCANIZED RUBBER TIRED WHEELS PROTECT FLOORS FROM DAMAGE.
HEAVY PIPE RACK
CASTER BRACKET BOLTED TO FRAME.
DOUBLE ANGLE IRON BOLTED FRAME

Just look at the rugged construction of these Fairbanks "Commander" steel-frame platform trucks with hardwood platform. Is it any wonder that they last years longer!

Note the way they're armored. Heavy steel angle irons protect the hardwood platform from bumps. They are built to take the most brutal punishment without injury.

Pipe handles and racks are held rigidly to frame by bolts, and can be removed at will. The platform, too, can be replaced, in case of accident, without cutting or rewelding frame or understructure.

Write for our Catalog No. 52

THE FAIRBANKS COMPANY
401 Lafayette St. New York, N. Y.
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Fairbanks
PLATFORM TRUCKS

How to give your Plant more Daylight ...without sacrificing *Temperature Control*

HERE IS a typical use of PC Glass Blocks in a food plant in Kansas City, Mo. In plants producing food products, PC Glass Block construction assures cleanliness, lots of light, temperature control and almost complete freedom from condensation on light areas.

LARGE daylight areas in your plant, and rigid temperature and humidity control are no longer inconsistent. PC Glass Block construction has solved that problem. It brings generous amounts of daylight into a factory . . . yet improves control of temperature and humidity, too, because PC Glass Block panels have high insulation value.

In fact, they combine the light-transmission properties of glass with approximately the heat-insulating value of a solid masonry wall. So heat loss through light areas is lessened. Moisture condensation on light areas is substantially reduced.

Further, PC Glass Block construction eliminates dirt infiltration at light areas. It insulates effectively against sound. It is exceptionally good looking, improving plant appearance. It is completely resistant to chemicals, fumes, acid corrosion. And it cuts maintenance costs by its easy cleaning properties, its elimination of window sash repairs and replacements, its reduction of fuel bills.

Send the coupon for our free book of facts about this amazingly versatile material. We are confident that you will find it worth your while. PC Glass Blocks are manufactured by Pittsburgh Corning Corporation.

At the New York World's Fair, see the exhibits of Pittsburgh Glass in the Glass Center Building, the Forward March of America Building, and the All-Glass House; and at the Golden Gate International Exposition, see them in the Homes and Gardens Building.

Distributed by

PITTSBURGH PLATE GLASS COMPANY

and by W. P. Fuller & Co. on the Pacific Coast

PITTSBURGH PC CORNING *Glass Blocks*

Pittsburgh Corning Corporation
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Please send me, without obligation, your book of facts about PC Glass Blocks entitled "The Glass Age Arrives."

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NOT-SO-DIFFICULT DECISION

3 are less trouble than 10!

THESE 3 EAGLE BEARING METALS

meet most bearing metal requirements

EAGLE DREADNAUGHT
For extreme speed and pressure conditions

EAGLE OUTLASTA
For medium speed and pressure conditions

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For low speed and pressure conditions

EAGLE Controlled Specifications protect your equipment . . . Play safe; specify Eagle Bearing Metals. Minimize trouble and costly shutdowns with these clean, primary metals, scientifically alloyed to lengthen life. No hard spots to cut or score the shaft. Sold through recognized distributors.

Eagle Tin-Loy is an ideal tinning compound that assures an effective lasting bond between bearing metal and the shell. Easy to use—efficient—economical.

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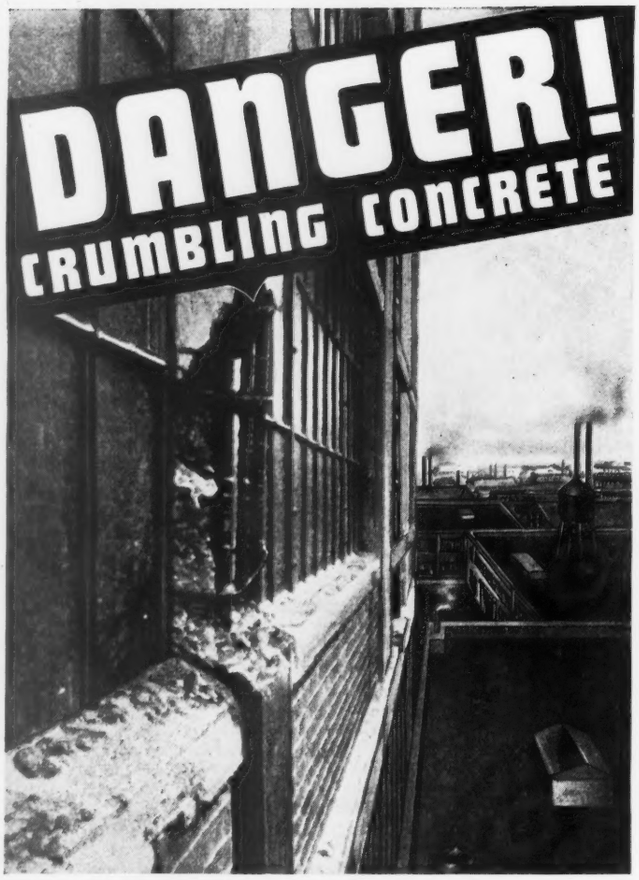

Today's Tiny Cracks Are Tomorrow's Costly Hazard

STOP THEM . . .

. . . with DUM DUM MASONOC

Small, innocent-looking cracks are the first sign of concrete deterioration. Moisture seeps in; the cracks widen and, without warning, concrete starts to crumble. When exposed, vital reinforcements are attacked by rust, window frames buckle and walls start to settle with disastrous results. You can avoid this costly hazard with DUM DUM MASONOC, a tough, rubbery, decorative weather-proofing material—15 to 20 times the thickness of paint—that seals cracks against the destructive forces of weather.

PREVENTS NEW CRACKS

Because it stays semi-plastic, DUM DUM MASONOC expands and contracts with movements of the building surface, thus preventing formation of new cracks. Send for complete information about this *different* protective coating for concrete which has saved thousands of dollars for its users.

DUM DUM MASONOC

A PRODUCT OF

The Arco Company
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INDUSTRY BUYS MORE G-E WATER COOLERS THAN ANY OTHER MAKE

Nearly 2,000,000 people now enjoy cool, healthful, refreshing drinking water from G-E Water Coolers every day.

Dependable, Thrifty Performance Gives G-E the Preference

• In most lines of industry there is usually ONE make of product that is outstanding—that merits and gets the preference. In water coolers it's *General Electric.* There are good reasons for the G-E's great popularity, why it is first choice of industry . . .

Research Keeps G-E Years Ahead

G-E Water Coolers are famous for dependable low-cost operation and long life. The new Stainless Steel Water Reservoir that ends rust, leaks and corrosion is just one of many General Electric advanced features that contribute to *enduring* economy. The G-E delivers the thrifty service you *must have* to make your investment profitable.

Catalog Free—Ask for it Today

The big, new General Electric Water Cooler Catalog shows the complete G-E line of models and all their new features. Ask your G-E Dealer for a free copy or write today to General Electric Co., Commercial Refrigeration Sec. CT5, Nela Park, Cleveland, O.

GENERAL ELECTRIC

MODELS FOR EVERY NEED

A PRACTICAL YARDSTICK

FOR *YOUR* INDUSTRIAL RELATIONS PROGRAM

IN planning a practical industrial relations program, apply this simple yardstick to the activity under consideration: "(1) Will it increase your employees' *ability* to do their jobs? (2) Will it increase their *willingness* to do their jobs? (3) Will it specifically better *relations* between your company and your employees as a group?"

Here are some of the activities that are being used successfully to build good will . . . that make men want to say: "I like the job and I like the company!"

1 Most men take pride in their job, company, *leaders.* Informal meetings, dinners, outings between workers and executives increase understanding—build solidly on self-respect

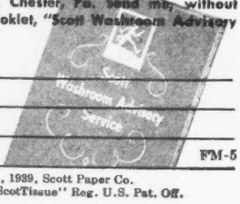
2 Modern, individual lockers with adequate seats, tables, hangers and good ventilation help save time lost through confusion . . . make for better co-operation among workers.

3 Have you a "Suggestion Box" where workers can deposit ideas for improving their jobs or departments? Careful consideration should be given contributions and suggestions recognized.

4 Sanitary washrooms with adequate basins, hot water, soap and plenty of "Soft-Weve" ScotTissue Towels remind workers that management is vitally interested in their health and welfare.

The Scott Washroom Advisory Service is available to help arrange washrooms comfortably, economically and efficiently. The Scott Survey will suggest how to relieve congestion, reduce waste, overhead expense, and create good will in your washrooms.

• Scott Paper Co., Chester, Pa. Send me, without obligation, your booklet, "Scott Washroom Advisory Service."



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YES, BUT How BUSY?
You'll never know exactly until you install the Servis Recorder.
It Tells When Each Machine Was Working or Idle—and How Long!
It shows up all delays—big or little. See how "time down" stands out on the chart below. You can't miss it. You can't help but reduce it! Suppose you could reduce idle time on all your factory machinery merely 10 minutes a day! What would it amount to in a year—or even a month! More than you will ever save by "little economies." The little "time clock for machinery," the Servis Recorder, bolts or clamps right on the machine itself—no ink, no pencils, no electric wires. Send for folder, "A Busy Plant."
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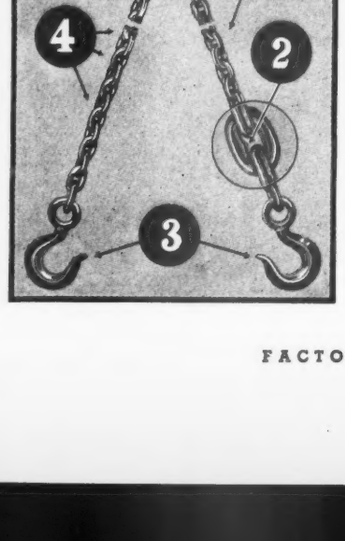
THIS MACHINE STOOD IDLE 2 HOURS
POINTS OUT ALL DELAYS
The Servis Recorder
The "Time Clock" for Machinery

HERC-ALLOY boosts the FACTOR of SAFETY in sling chains



Industry has accepted HERC-ALLOY (Heat Treated Alloy) as one of the toughest, strongest metals ever used to hoist a load. That's why HERC-ALLOY Electric Welded Sling Chains are winning new laurels every day for safety and for cost-cutting performance on all kinds of heavy-duty lifting operations. Better play safe with men, equipment and materials—specify HERC-ALLOY Sling Chains and have strength to spare! Check these superiorities:

(1) Heat Treated HERC-ALLOY throughout the entire chain to give maximum uniform strength. (2) Links are INSWELL Electric Welded by a new process fully covered by patents. (3) HERC-ALLOY Heat Treated Hooks give maximum strength at these vital points. (4) Short, narrow links reduce to a minimum the danger of bending or gouging around sharp corners. (5) All Joiner Links are of Heat Treated HERC-ALLOY.

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IT'S DULUX HIGH-HIDING MILL WHITE

Developed to give excellent results with only ONE COAT

HERE'S the mill white that operators have been waiting for!

It's DULUX High-Hiding Mill White . . . developed in Du Pont research laboratories, carefully pre-tested under actual working conditions . . . and is now ready for sale.

DULUX High-Hiding Mill White lives up to its name. It has all the DULUX advantages of extreme whiteness retention, long life, low application cost.

But the big news is its amazing hiding power. The hiding of DULUX High-Hiding Mill White is so intense that, if the present finish is in reasonably good condition, it gives excellent results with only *one coat!* In cases where the present finish is very poor, it may require an undercoat.

DULUX hides exceptionally well because it contains a greater amount of pure titanium dioxide, the whitest pigment known to paint chemistry. It starts white and it *stays* white, thanks to the precise, time-proved balance of pigments with the DULUX vehicle.

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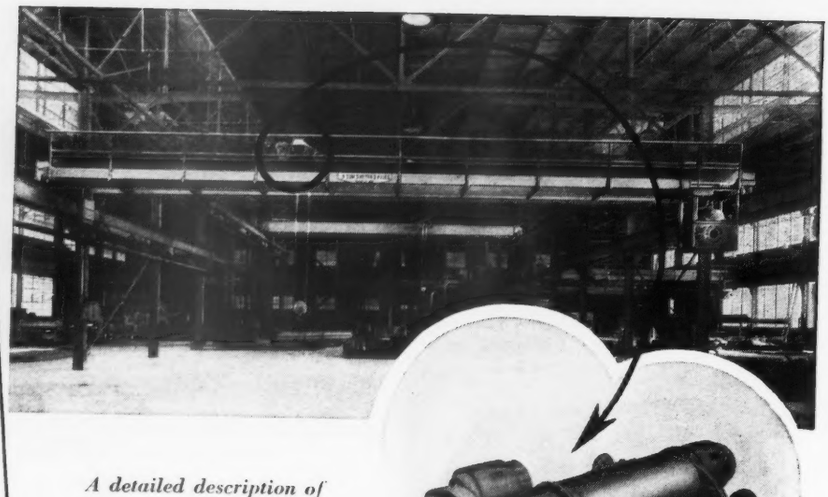
CAPACITIES 1 TO 450 TONS

THE trolley is the heart of a crane. Not unlike the human heart, it must be sturdy to withstand shocks—responsive to unexpected demands—with stamina and endurance for hard work day after day.

A few of the features that contribute to the long life and trustworthy service of Shepard Niles crane trolleys are—load carrying frame of steel—balanced drive gearing—automatic oil bath lubrication and complete enclosures for all vital parts.



A detailed description of the heart of a Shepard Niles crane is given in Bulletin No. 123. A copy is yours for the asking.

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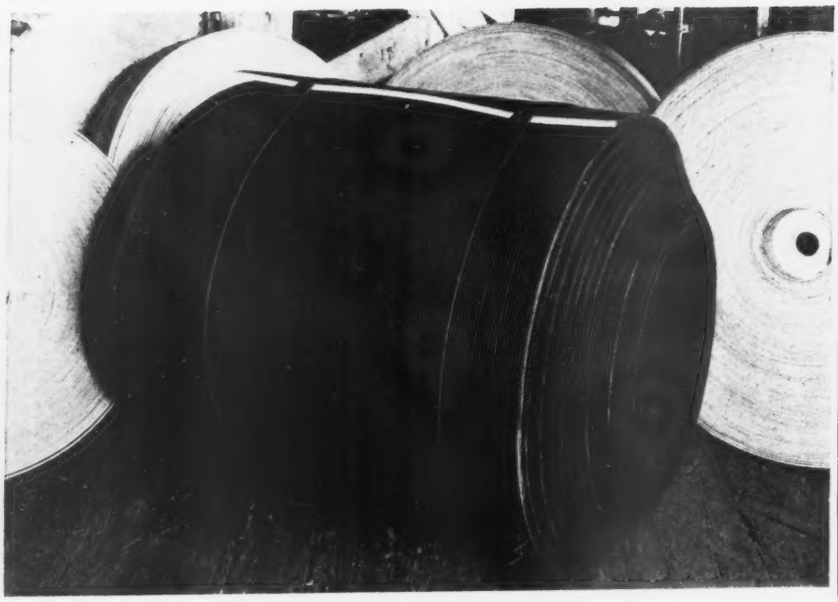

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and a yard wide!

You should actually see this belt. It's big, it's tough, three feet wide, three plies thick, 100 feet long and *treaded*. When you read this it will be doing a better job than any other belt could do . . . in one of the country's greatest steel plants. We are confident of this superior performance because the exclusive tannage of VIM TRED Leather belts gives them an exceptionally high coefficient of friction, and their patented tread "gears" them to the pulley . . . provides better grip. To signify our confidence, each VIM TRED Leather belt is

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TO COST LESS PER UNIT PRODUCED

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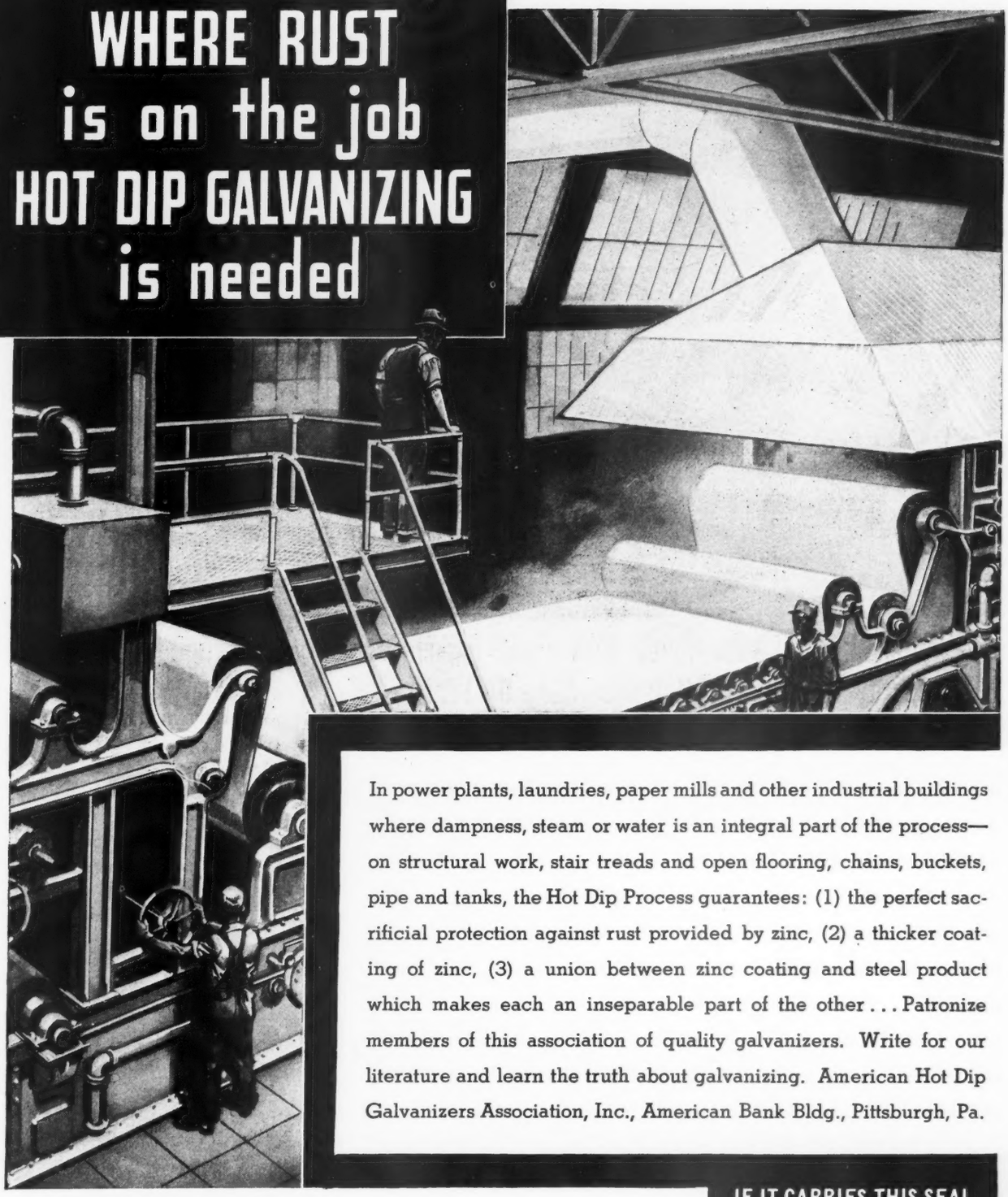

In power plants, laundries, paper mills and other industrial buildings where dampness, steam or water is an integral part of the process—on structural work, stair treads and open flooring, chains, buckets, pipe and tanks, the Hot Dip Process guarantees: (1) the perfect sacrificial protection against rust provided by zinc, (2) a thicker coating of zinc, (3) a union between zinc coating and steel product which makes each an inseparable part of the other . . . Patronize members of this association of quality galvanizers. Write for our literature and learn the truth about galvanizing. American Hot Dip Galvanizers Association, Inc., American Bank Bldg., Pittsburgh, Pa.

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MAN POWER

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BACK of every business success is the human element. No organization with a poorly selected personnel can be long successful. No organization with a wisely chosen body of employees can be anything but successful.

Every man who goes on your payroll should be employed only after a rigid weeding out process. An advertisement in *Factory Management and Maintenance* is the first step toward eliminating the undesirables, for only sincere, intelligent, and forward looking men read this paper regularly. They are the kind of men you want in your employ. They are the kind of men you *must* have if *your* business success is to be assured.

Take the first step toward increasing the MAN POWER rating of your business by using the employment advertising service of *"Factory."*

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Departmental
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MAKE every dollar invested in pyrometers more productive with this

PORTABLE PRECISION PYROMETER

(POTENTIOMETER)

Here is a rugged yet extremely precise and flexible portable pyrometer. It is the ideal instrument for checking thermocouples and service instruments, enabling operators to keep indicating, recording or control pyrometers functioning at maximum accuracy. A Foxboro Portable Potentiometer is inexpensive insurance against interruptions and losses by inaccuracies in service instruments.

This portable pyrometer may be used as a spare, for exploratory work, or wherever a permanent pyrometer installation is not desired. A temperature scale 17" long on a vernier operated dial makes accurate readings easy and positive. The instrument may be operated in a horizontal or vertical position with equal accuracy. Cold junction compensation is provided.

You will find this new portable pyrometer a profitable investment. Write for a copy of Bulletin 763. It describes the simplicity with which this precision pyrometer can be operated and describes the features in detail. The Foxboro Company, 12 Neponset Ave., Foxboro, Massachusetts, U. S. A.

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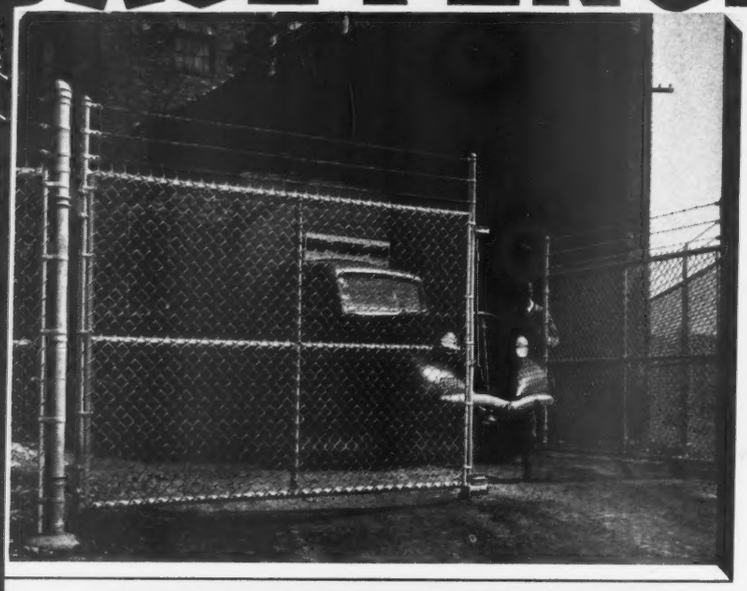
Product of Page Steel & Wire Division, American Chain & Cable Company, Inc.



NOT EVERYONE NEEDS AN ALUMINUM FENCE

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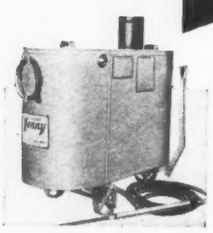
on the job!



We have.....men employed in maintenance.
We clean.....pieces of machinery monthly.
We clean.....sq. ft. of industrial windows.
We want to clean ☐ small tools, ☐ machines, ☐ cranes, ☐ runways, ☐ floors, ☐ walls.

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Take off the INVISIBLE Brakes—

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REDUCE POWER—RETARD SPEED
INCREASE COST—CHEAT PRODUCTION
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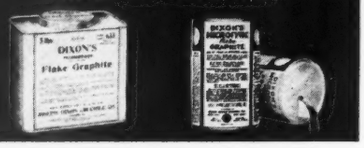

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GRAPHITED LUBRICANTS

successfully fight friction, check machinery wear, increase power—which means *higher plant efficiency.*

DIXON'S TICONDEROGA FLAKE LUBRICATING GRAPHITE

meets the exacting lubrication requirements of present-day fast-speed power and production equipment all over the world.

For fifty years power engineers have recognized the inherent qualities of this Dixon product—and they rate it higher today than ever before as an indispensable lubricant, an invaluable coating for gaskets, for packing and miscellaneous uses with modern fast-production machinery.

Dixon's Ticonderoga Flake Lubricating Graphite comes in two Flake sizes:

No. 1—Large unctuous, lustrous flakes of highest grade.

No. 2—Finely sub-divided, powdered flakes of highest grade.

DIXON'S MICROFYNE FLAKE GRAPHITE

Processed to a microscopic subdivision in particle size. Offers oilless, greaseless, temperature-proof, combustion-proof water-proof lubrication. When used as a co-lubricant with oil or grease, it often gives more than double the service. Can be cleanly and economically applied with Dixon's (Rubber) or "Junior" Graph-Air-Guns.

Available in cans, buckets and drums.

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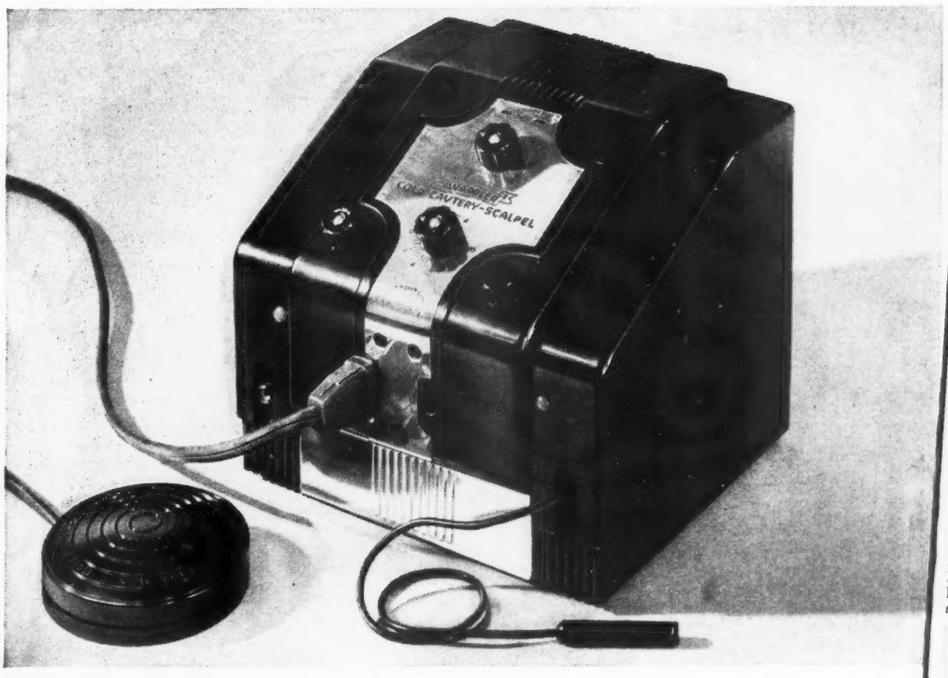
Jersey City, New Jersey
DIXON'S GRAPHITE PRODUCTIONS

SEND FOR CIRCULARS

ASSEMBLY TIME *halved*...
WEIGHT *cut 62%*...
SIZE *reduced 78%*

with the aid of Bakelite Plastics



RESULTS are often amazing when sound engineering, careful planning and skillful designing combine to recreate a product with Bakelite Plastics as an important factor.

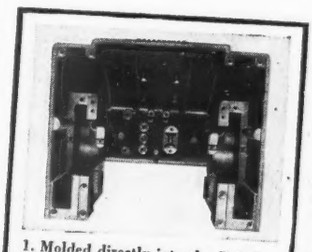
The newest model of Wappler Cautery Scalpel is an example. With redesigning, came economies of assembly and construction. Painstaking hand operations were eliminated. Mechanical short-cuts, such as the use of jigs, dies and fittings became practical. Assembly time was halved.

The Bakelite Molded housing provides position and support for all component parts, eliminating some operations, systematizing others. Electrical receptacles are no longer attached—they are integral. Assembly of the circuit is made directly into the housing to a considerable degree.

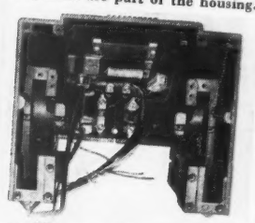
A more modern, more attractive unit has resulted . . . 78% smaller and 62% lighter than any previous model. Manufacturing costs were reduced so considerably that the new unit sells for 70% less than its predecessor!

In all probability, there are definite savings of costs and operations awaiting your use of Bakelite plastics. Write for Portfolio 16 of informative booklets describing many types of Bakelite Plastics available to meet varying industrial requirements.

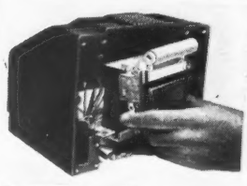
Bakelite Corporation, 247 Park Avenue, N.Y.
Chicago: 43 East Ohio St. *Bakelite Corporation of Canada, Ltd.*, 163 Dufferin St., Toronto *West Coast:* Electrical Specialty Co., Inc., San Francisco, Los Angeles and Seattle



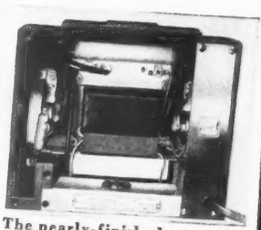
1. Molded directly into the Bakelite plastics housing are accurately-positioned mountings or ports for every component part. Even electrical receptacles are part of the housing.



2. Two rheostats and a coil have been affixed. Portions of the wiring have been introduced. Self-tapping screws have been used throughout.



3. The transformer and part of the circuit are being inserted as a single unit. They rest on supports provided in the housing.



4. The nearly-finished assembly shows the compactness and efficiency achieved through the use of a Bakelite Molded housing.

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The registered trade mark shown above distinguishes materials manufactured by Bakelite Corporation. Under the capital "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products.
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STEEL GRATING
MEANS SAFE FOOTING FOR INDUSTRY!

Look through your plant. Note the many places where safe, well-ventilated, bright, open flooring could be used to advantage.

Then send for FREE sample of Blaw-Knox Electroforged Steel Grating. You'll see at once that it's easy to walk on, non-slip, does not impede wheeled vehicle movement. You can have it in any size or shape you specify. And the cost is extremely moderate.

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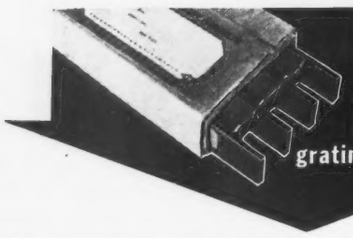

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Stop costly mistakes this simple way

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Send me free Burgess Acousti-booth Bulletin

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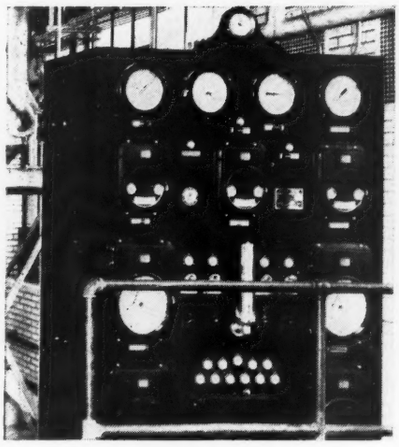
Manufacturing under Burgess Patents

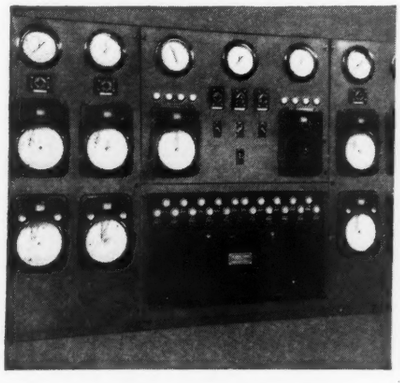
BURGESS

NOW, even your most critical processing operations CAN BE CONTROLLED completely... automatically!



IN WIDE USE TODAY

This modern technique of process control is now being used by some of the most progressive and successful manufacturers in this country.



Another feature of

BRISTOL'S SYSTEM of COORDINATED PROCESS CONTROL that helps you end rejects, cut costs, improve quality!

In many plants there are processes which frequently are so complicated that it is almost impossible for the operators, by manual manipulations alone, to exercise the supervisory control which the process requires. Often two or more variables such as temperature, liquid level and flow must be closely regulated under critical conditions. Or they must be coordinated on an exact time schedule and interlocked with mechanical operations such as starting and stopping pumps, or opening and closing valves.

For solving processing problems of this kind, the modern trend is to Bristol's System of Coordinated Process Control. A development of far-reaching significance, Coordinated Process Control is applicable to a *whole process*. It puts every factor that influences processing under absolute automatic control. Nothing is left to chance, or to the uncertainties or irregularities of human judgment. There is no opportunity for yield, quality, process time or cost to fluctuate. Product uniformity is a certainty.

Our Bulletin No. 460-511F high-lights the almost incredible economies and benefits which Coordinated Process Control is now making possible. It will be of interest to every executive responsible for production at a greater profit. On request.

More Than Just Instruments

Bristol's System of Coordinated Process Control is made possible *only by the combination* of (a) the ability, experience and facilities of the Bristol's engineering staff to apply to a given plant problem a simplified layout of modern instruments providing complete coordinated process automaticity, (b) Bristol's Process Cycle Controller, the "mechanical brain" of coordinated process engineering, and (c) the complete line of Bristol's controlling, recording and indicating instruments for pressure, level, temperature, humidity, flow, motion, electrical quantities, etc., —a complete service backed by Bristol's undivided responsibility.

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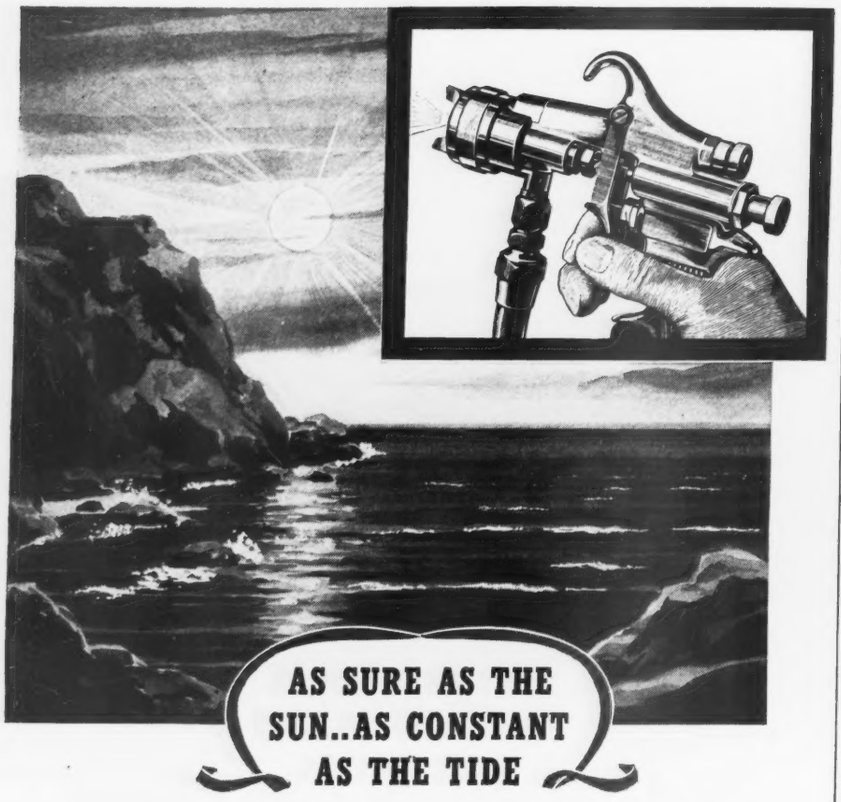
WATERURY, CONNECTICUT

Branch Offices: Akron, Birmingham, Boston, Chicago, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco, Seattle. Canada: The Bristol Company of Canada, Limited, Toronto, Ontario. England: Bristol's Instrument Company, Limited, London, N.W. 10

Bristol's System of COORDINATED PROCESS CONTROL

INDUSTRY'S GUIDE TO A UNIFORM PRODUCT



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CONTINUES TO IMPROVE QUALITY AND INCREASE PROFITS IN THE PRODUCT-FINISHING FIELD

● DeVilbiss reliability is positive and profitable. It's specifically planned and produced . . . by the most thoroughly trained and experienced organization of spray engineers and craftsmen . . . by men who have met and mastered product-finishing problems for years. And that means a lot to you!

You can depend on DeVilbiss to produce the correct equipment for any product-finishing problem — for any finishing or coating material — for products of any size or shape — for any plant or production set-up. You can bank on DeVilbiss experience to produce increased efficiency and greater economy — profitable performance year after year!

On any product-finishing or coating problem, do as so many experienced industrial executives do . . . call DeVilbiss. A profitable solution to the most perplexing problem is as simple as that!

THE COMPLETE DeVILBISS LINE CONSISTS OF: Spray finishing equipment . . Automatic coating machines . . Tanks for spray materials . . Spray booths and exhaust fans for vapor and dust elimination . . Air regulators, cleaners and dusters . . Air compressors . . Respirators . . Specialized hose for paint, air, water, gasoline, welding and pneumatic tools . . Hose connections . . Water and oil guns . . Equipment to prevent offset in printing . . Paint stripers . . Medicinal atomizers . . Perfume atomizers.

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"Where to Locate the Plant?"

"Where Shall We Build?"

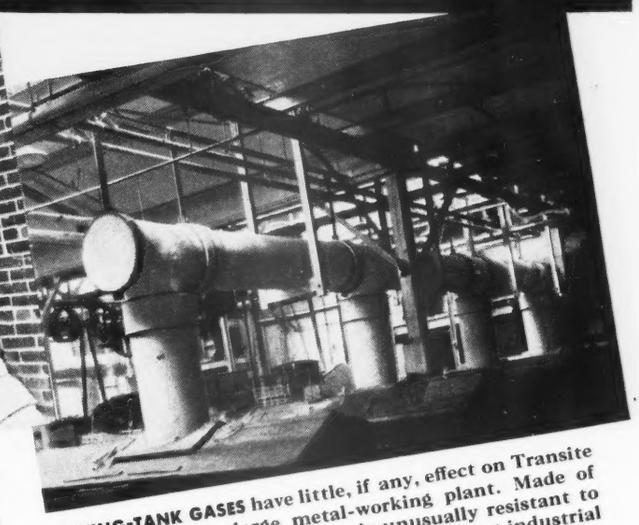
Articles titled as above, written respectively by Charles P. Wood, Industrial Engineer, of Lockwood Greene, Engineers, Inc., and George C. Smith, Assistant to the President of the Missouri - Kansas - Texas R.R. Company, and a former Chairman of the American Industrial Development Council, are major contributions on the subject of plant location from the 1937 and 1938 Industrial Plant Building sections of "Factory".

For the benefit of those executives of manufacturing plants to whom this subject is of immediate or imminent interest the foregoing articles have been assembled in reprint form and are available on request, without charge. Only a limited supply of this reprint is on hand and distribution must therefore be restricted to single copies.

Address your request to "Factory" referring to "Plant Location Reprint".

GOES UP FASTER, this durable CUSTOM-MADE VENT PIPE

CORROSIVE LABORATORY FUMES are vented efficiently, at low cost, in the Climax Molybdenum plant, through J-M Transite Pipe. In spite of the variety of sizes used on this job, installation was rapidly completed. For Transite is supplied in a size for every need, with fittings for every construction requirement.



PLATING-TANK GASES have little, if any, effect on Transite "S" Pipe in this large metal-working plant. Made of asbestos and cement, Transite is unusually resistant to all forms of corrosion . . . ideal for venting most industrial fumes, gases, vapors and dust.

AREN'T these the three main features you're looking for in venting systems—easy, economical installation, long life and low maintenance? Then check these features of J-M Transite "S" Pipe—

Custom-made for venting industrial fumes, gases, vapors and dust, Transite is formed under pressure into a tough integral structure free of longitudinal joints. Its long, 13-ft. lengths, complete line of fittings, and the ease with which it may be cut and sawed, speed up installation, cut costs—even in restricted working quarters.

Once up, Transite "S" Pipe offers many other money-saving advantages. Made of asbestos and cement it is uniformly strong, durable and highly resistant to corrosion—provides maximum assurance of long life and minimum maintenance.

Considering all these facts, the cost of Transite "S" Pipe is surprisingly small. You should have complete information before you install your next venting system. Write for Brochure D.S.-336, Johns-Manville, 22 East 40th Street, New York, N. Y.

HOT MURIATIC-ACID FUMES have been vented in the Hot Tin Plate Department of the Hobart Manufacturing Company for years by J-M Transite "S" Pipe. To date, there is no sign of deterioration of the Transite . . . and company officials look forward to many more years of efficient service at low cost.

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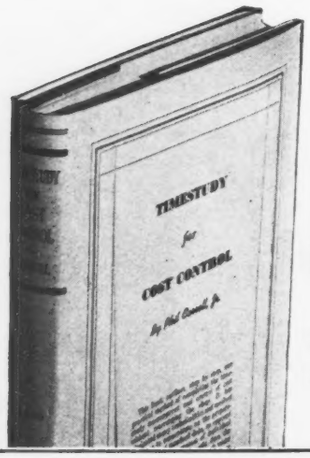
FOR EFFICIENT, LOW-COST INDUSTRIAL VENTING SYSTEMS



How to make timestudies and how to use them

To lower costs and improve managerial control

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—the description of the work involved;
—the type of personnel fitted for it, departmental organization;
—the expert information on how to make comparison sheets, how to handle setup time, how to handle variables, etc., etc.
—the application of these methods to many departments of business.

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into operation, opening or closing valves of all kinds, even those that manually require several men to operate. The job can be done by LIMITORQUE in far less time than by hand, at a small fraction of the labor cost. So accurate is LIMITORQUE'S mechanical control that 100% protection is assured against broken or damaged valve parts.

LIMITORQUE fits valves of all types and makes. It can also be fitted to existing equipment. Write now for full information.

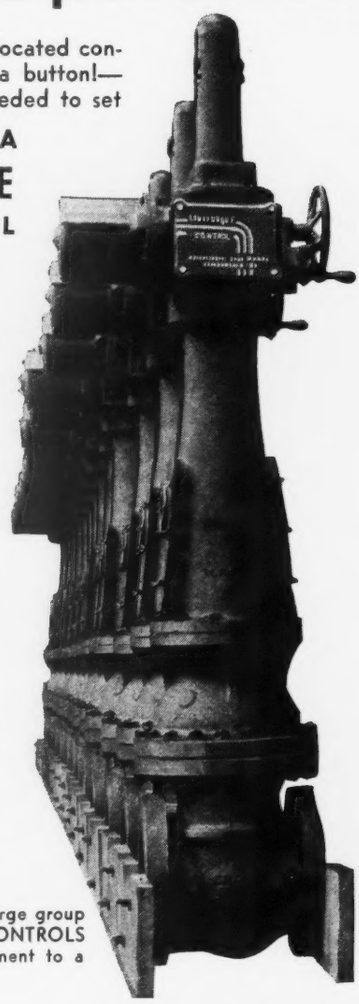

Photo shows a portion of a large group of LIMITORQUE CONTROLS mounted on Valves for shipment to a large oil refinery.

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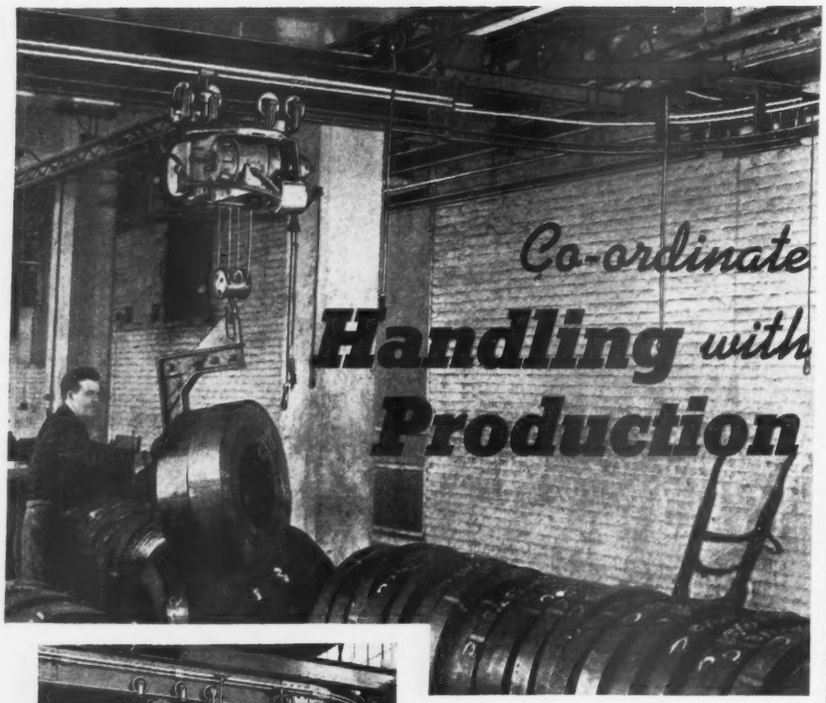
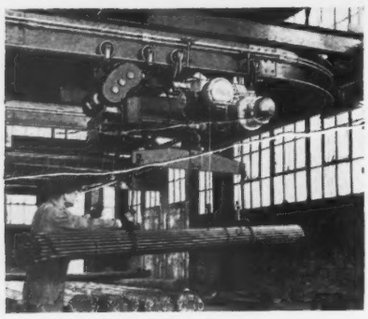
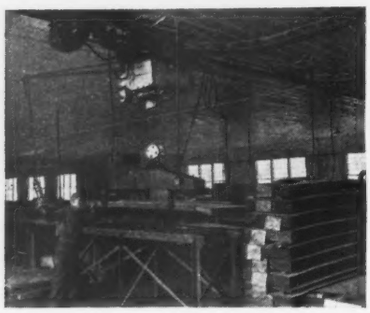




MonoTractor and Hoist on 3-ton RailMaster System.



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SMALL enough to fit any space, smartly styled, the new Carrier Water Cooler is completely automatic from cooler to bubbler. Cooling equipment, made dependable and economical by 49 years of experience in mechanical refrigeration, chills the water to the temperature you want. Every part is sealed tight against accidental breakage from jarring. Read the 10 big features shown on the left.

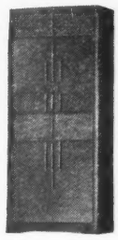
Call your local Carrier dealer today. Without obligation—learn about the new Carrier Water Cooler and how it can solve your problem of pure, healthful water supply at new low cost.

10 BIG FEATURES

- ★ **GREATER CAPACITY** *and lower operating cost because of special pre-cooling unit which utilizes drain water to help cool incoming water.*
- ★ **SANITARY BUBBLER.** *Chromium guard protects water outlet from contact with lips. All parts are accessible and easy to clean.*
- ★ **NO SPLASH.** *Deep, clover-leaf shaped waste bowl prevents splashing.*
- ★ **EVEN FLOW.** *Water flow controlled by regulating valve which automatically prevents stream fluctuation.*
- ★ **TEMPERATURE REGULATOR.** *Easily operated dial permits adjustment to meet conditions.*
- ★ **GLASS FILLER.** *Provision made on cooler for water glass or pitcher filler. Standard equipment.*
- ★ **TIGHT FASTENINGS.** *Incoming water and drain lines are fastened tightly to prevent damage by jarring.*
- ★ **ATTRACTIVE STYLING.** *Bronze cabinet and modern design blend with smart furniture. All fittings of highly polished chrome.*
- ★ **COMPACT.** *Occupies a space only 15½ inches square.*
- ★ **CARRIER DEVELOPMENT.** *All parts and claims backed by Carrier's long experience in refrigeration and air conditioning.*

MORE NEWS!

Cool comfort in your home or office is easy to have with the *new* Carrier Room Air Conditioner (right). No building alterations, plugs in like a lamp—cools, dehumidifies, circulates and filters all the air—inside and outside.



FOR LARGER SPACE

the new 1939 self-contained Air Conditioners (left) offer new economies, new efficiencies and new conveniences in self-contained air conditioning. "All-in-one-unit" comes in nine sizes to fit any space, to bring you true air conditioning at lowest prices in Carrier history.

CARRIER IGLOO OF TOMORROW

•

NEW YORK WORLD'S FAIR

CARRIER CORPORATION
"Weather Maker to the World"
Syracuse, New York, Desk E8
In Canada, Box 1050, Station C, Toronto

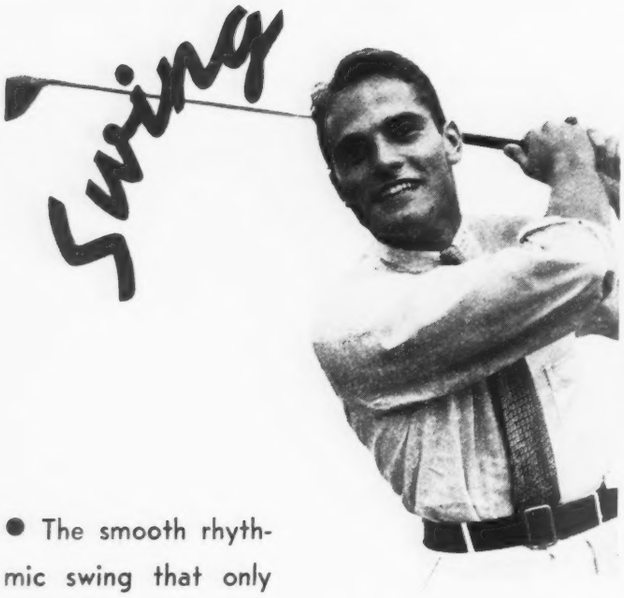
Please send complete information about the new ☐ Carrier Water Cooler ☐ Room Cooler ☐ Self-Contained Units.

Name.....

Company.....

Address.....

City.....State.....



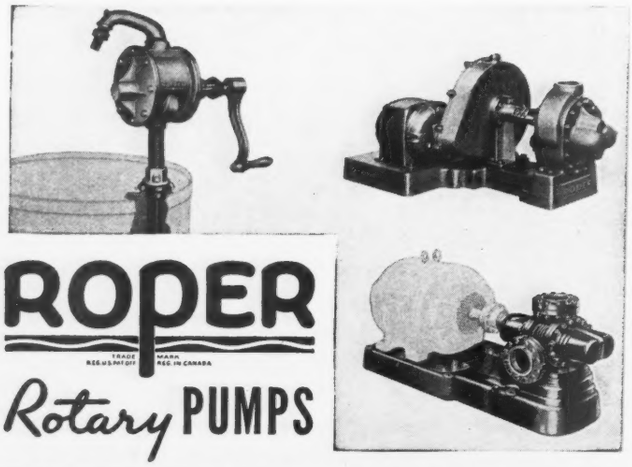
● The smooth rhythmic swing that only perfect coordination can beget is most apparent in Roper Pumps.

All pumps bearing the name "Roper" are built to the most exacting standards . . . built with a minimum of working parts that only good engineering and long experience can accomplish . . . built with a stamina that only the years can verify.

Yes, Roper Pumps are smooth performers that operate with the lowest possible power consumption . . . and they're easy to install, easy to service.

Write FOR BULLETIN F-278 AND PRICES

GEO. D. ROPER CORP., ROCKFORD, ILL., U.S.A.



ROPER

TRADE REG. U.S. PAT. OFF. MARK REG. IN CANADA

Rotary **PUMPS**

DEPENDABLE SINCE 1857

EWC TRAILERS

Carriers of materials and merchandise in every type of industry, adapted to every requirement.

Many standard models for the ordinary jobs—hundreds of variations engineered to cut handling costs on individual and special haulage problems.

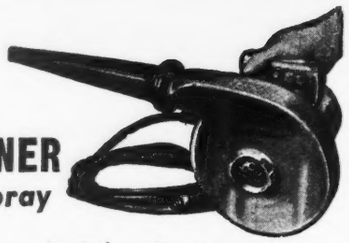
Trailers for yard hauls, for combination floor and yard work, for street hauls; any capacity, platform or dump body, and with any type of racks or body to suit requirement.

Representatives in principal cities. *Write* for bulletins, describing your problem.

ELECTRIC WHEEL COMPANY

DEPT. FA, WALTON PLACE — QUINCY, ILLINOIS

IDEAL



JUMBO CLEANER

Blow-Vacuum-Spray

When *Ideal* Cleaners come in, Industry's worst enemy—*dust*—goes out. No more high, wasteful machinery and motor depreciation. You can now have healthy plant working conditions—*at Low Cost.*

3 FEATURES. Blows or *Vacuums* dust, dirt and filth from the most inaccessible places. *Sprays*—paints, oils, lacquers and insecticides.

POWERFUL—full 1 H.P. Universal motor—blows high velocity, low pressure air stream—24,200 ft. per minute.

PORTABLE—weighs only 14 pounds—plugs into any standard light socket.

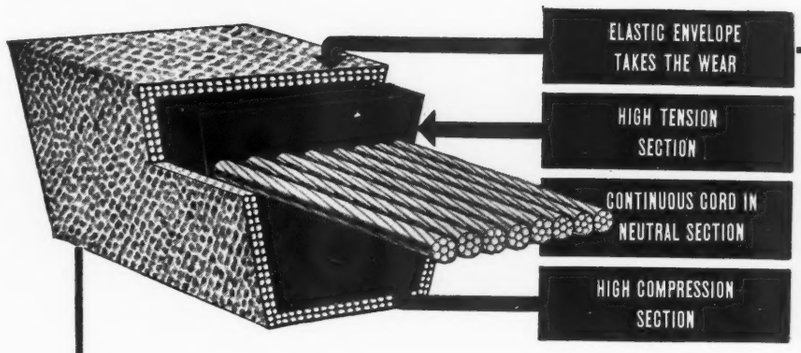
VERSATILE—many special attachments available—for wide range of cleaning operations in plants and offices.

ASK FOR FREE TRIAL DEMONSTRATION

Electrical Products Division

IDEAL COMMUTATOR DRESSER COMPANY

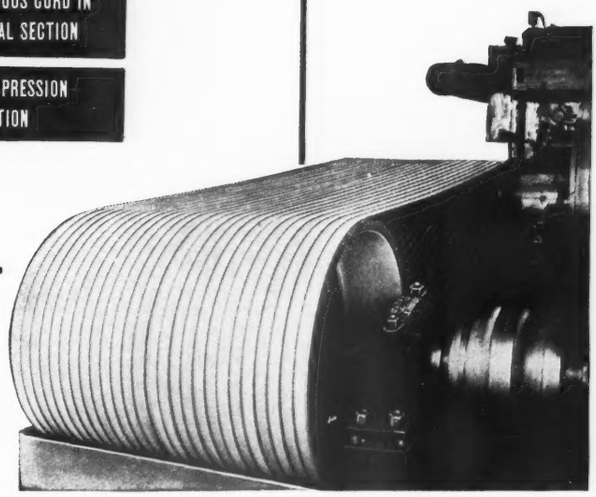
1416 Park Avenue **Sycamore, Illinois**



Their Balanced

GROOVE-GRIPPING ACTION

Gives You Maximum Power Transmission ~ **AT MINIMUM COST**



New MEDART V-BELTS

"They Grip the Grooves"

The New Medart V-Belts with their "groove-gripping" action are precision engineered and constructed—assuring maximum power transmission—*at minimum cost.*

The load-carrying cord section of the belt is concentrated at the neutral axis of the belt assuring minimum friction and safeguarding the tension-carrying element from internal breakdown.

Further—each strand in each individual belt, as well as each belt in a multiple drive, carries its proportionate share of the load. . . . This results in smooth, uniform action—permits maximum belt tension—eliminates undue wear or strain—prolongs belt life.

Investigate Now the money saving advantages you get with these new Medart V-Belts. "They Grip the Grooves."

Get in Touch with Your Medart Representative or Distributor. They will assist you in the selection of a complete V-belt drive that will give you continuous, trouble-free service at the lowest cost.

THE MEDART COMPANY

3512 DeKalb St. • • • St. Louis, Mo.

MEDART

Holding your own as a business executive

clarified and made easier by these books

THERE is nothing sadder than the cases of star performers in production, in sales, accounting, or other department of business practice, who fail to take hold when faced with executive duties and opportunities. The problems of analyzing, deciding, planning, and administering involve broad fundamentals that, consciously or otherwise, the successful executive uses every day. And to provide a comprehensive, adequate treatment of these principles, is the purpose of this library.

THE

BUSINESS EXECUTIVES' LIBRARY

7 volmes, 5½ x 8, 1900 pages, illustrated

THESE books give you the seven fundamental principles upon which executive success depends: 1. Know yourself and how to lead others. 2. Know your own business and business generally. 3. Know how to organize and manage your own department of an entire organization. 4. Know how to budget and forecast and plan for the future. 5. Know finances and how to make full use of your bank. 6. Know how to talk convincingly—how to sell your ideas and influence others. 7. Know how to think—how to analyze problems and arrive at correct solutions. Step by step this Library takes up these basic principles and shows how they may be mastered and applied.

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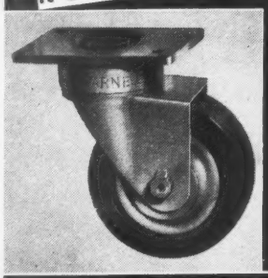

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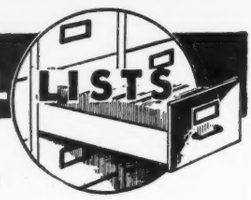

As publishers of Radio Retailing for twelve years, McGraw-Hill is uniquely equipped to offer complete, authoritative Direct Mail coverage of the Radio Trade. Extreme accuracy (guaranteed 98%) is maintained on a daily corrected basis and the widest possible selections are available. Send for folder entitled "Hundreds of Thousands of Reasons Why" which describes how McGraw-Hill lists are built and maintained.

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- Radio Wholesalers
- Radio Dealers
  - Larger Dealers
  - Smaller Dealers
- Occupational Groups
  - Automotive Stores
  - Central Station Stores
  - Hardware Stores
  - Etc.
- Radio Service Dealers and Service Men
- Geographical Selections
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Write for folder "Radio Trade Outlets" giving details on selections, state counts, prices, etc. . . . or ask any representative.

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Wood and Franklin Streets, Station 21
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Training in Work Simplification
330 W. 42nd Street
NEW YORK CITY

INEFFICIENCY

with its resultant waste, plays havoc with production costs.

PROFITABLE OPERATION

is dependent upon correct plant design, management, processes, equipment and methods.

ADVICE

available through a CONSULTING ENGINEER is frequently the only necessary means of putting a plant on a more efficient production basis.

Buell will accomplish this for you

Buell Dust Collectors bring you that combination of high efficiency and low cost which the patented Van Tongeren system is demonstrating in more than a thousand installations.

Those installations are earning the good will of workmen and of entire communities. They are earning equally important and more tangible profits in the salvaging of valuable dusts, the processing of a great variety of products, the reduction of many operating and overhead costs.

For a clear, practical presentation of dust collection or fly ash correction ask us for *Bulletin D81* (on industrial dusts) or *Booklet A93* (on fly ash). Either, or both, will be sent free to any managing executive or operating engineer.

The Only Cyclones with a Dust Pocket

BUELL ENGINEERING COMPANY INC
12 Cedar Street, New York
SALES OFFICES IN PRINCIPAL CITIES

buell
DUST COLLECTORS

For Bigger Output at Lower Costs

The value of our forty years experience in building better buckets is best demonstrated by the enthusiastic comments of their owners. Here is a typical letter. "We are handling more coal with our new Industrial Brownhoist 1¼ yard Clamshell than we ever did with our old 2-yard bucket."

Because the new Industrial Brownhoist buckets are designed to meet today's material handling problems, increased production and profits invariably result wherever they are used. Built in capacities of ½ to 15 yards and in Rope-Reeve, Power-Wheel, Lever-Arm and Link-types.

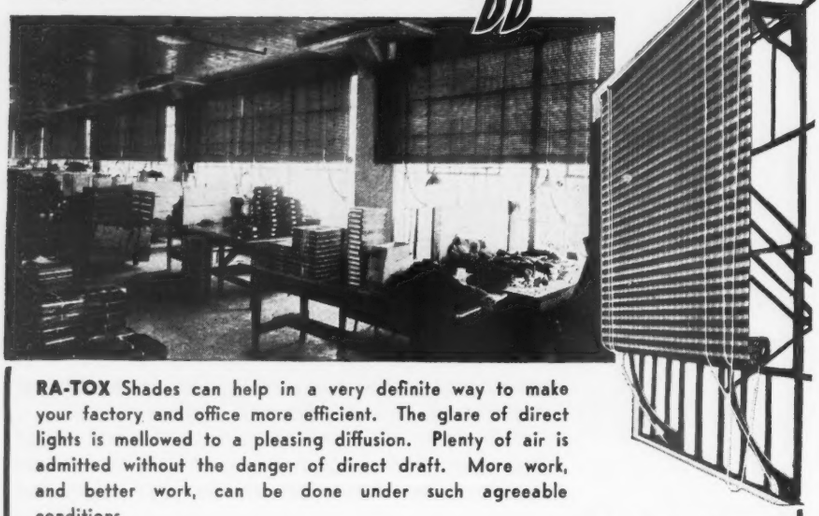
Book No. 353 contains unusually complete data on bucket design and construction. Send for a copy.

INDUSTRIAL BROWNHOIST CORP.
BAY CITY, MICHIGAN

District Offices: New York, Philadelphia, Pittsburgh, Cleveland, Chicago.

INDUSTRIAL BROWNHOIST *Clamshell Buckets*

RA-TOX FOR *efficiency*



RA-TOX Shades can help in a very definite way to make your factory and office more efficient. The glare of direct lights is mellowed to a pleasing diffusion. Plenty of air is admitted without the danger of direct draft. More work, and better work, can be done under such agreeable conditions.

RA-TOX Shades have proved their efficiency in leading factories throughout the country. They are available in narrow splints as well as standard width; square-edge splints and bevel-edge splints; and in three finishes—stain, metallic aluminum, enamel.

Made of selected basswood strips, woven parallel with hard twist seine twine; attractive, fast colors add smart, business-like appearance.

Write us today and let us show you by word and picture how **RA-TOX** Shades have benefited many factories and offices, and how they give service for years and years.

HOUGH SHADE CORPORATION
1043 Jackson St., Janesville, Wis.
Send complete RA-TOX details at once.

Name.....
Address.....
City.....
State.....
☐ Steel Sash ☐ Wood Sash

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Power Services
Product Engineering & Design
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Radio Dealers & Wholesalers
Radio Engineering & Design

For further details, selections from above basic classifications, counts, prices, etc., or estimates on special lists . . . ask any representative or write to

DIRECT MAIL DIVISION
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Complete Lists Covering Industry's Major Markets

WHERE TO BUY

SUPPLEMENT

Featuring additional products and specialties for manufacturing plants

One Inexpensive Modern Device . . .

installed at a crucial spot can frequently remove the "bugs" from an entire process.

It's the faster and surer electrical and mechanical "helps" and "hazard removers" that reduce costs and save company money.

One product advertised on this page may be the answer to *your* problem . . . *a real money-saver for your company.*

To be informed—and reminded—on modern aids to efficient and economical plant operation, check "Service Section" Advertising regularly . . . *every issue.*

For additional information write

Departmental Advertising Staff

FACTORY MANAGEMENT and MAINTENANCE

330 West 42d St., New York City

40 TYPES OF MEYLAN STOP-WATCHES

A watch for every purpose

Let us send folder No. 4F fully illustrating and describing some 40 types of stopwatches. No salesmen will call.

REPAIR SERVICE for all kinds of plain and complicated stopwatches. Send to us for estimates; no charge, no obligation.

A. R. & J. E. MEYLAN

"Specialists in timing instruments"

264-70 W. 40th St., N. Y. City, N. Y.

Find what you are looking for? If this or other advertising in this issue does not supply the information wanted, of products or services, write

Factory Management and Maintenance
330 West 42nd Street, New York City

THE NEW PATENT STOPWATCH!

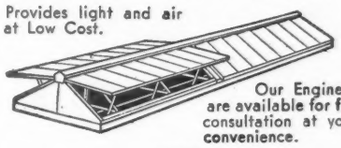
Guaranteed against breakage and wear. FREE TRIAL! Send for catalog today.

Repair Specialists, All Makes

M. Ducommun Co., 580 5th Ave. New York City

VENT-O-LITE INDUSTRIAL SKYLIGHTS

Provides light and air at Low Cost.



Our Engineers are available for free consultation at your convenience.

WRITE

VENT-O-LITE COMPANY

4230 W. TAYLOR STREET
CHICAGO
FOR DESCRIPTIVE LITERATURE

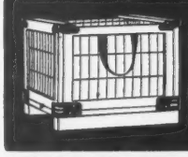
Try TRICO OILERS

Maintain a constant level of oil in bearings, gear boxes, line shafts, etc. Visible automatic. 1 filling lasts 6 to 12 months.

WRITE FOR LITERATURE

TRICO FUSE MFG. CO. Milwaukee, Wisconsin

LOWER HANDLING COSTS!



LEWIS CONTAINERS

Skid Boxes - Box Trucks
Shipping Boxes - Trays

G. B. LEWIS CO.
Dept. X1 Watertown, Wis.

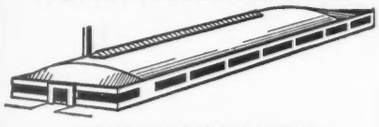
TRICO KLIPLOK CLAMPS FOR FUSE CLIPS

Lock fuses and clips together. Eliminate burnt fuses, premature blowings, wasted power.

WRITE FOR LITERATURE

TRICO FUSE MFG. CO. Milwaukee, Wisconsin

LOW COST—CLEAR SPAN WOOD TRUSSES INCREASE FACTORY PRODUCTION SPACE



BEFORE BUILDING CONSULT

SUMMERBELL TRUSS COMPANY

4230 W. TAYLOR STREET
CHICAGO

THE PURE OIL CO.

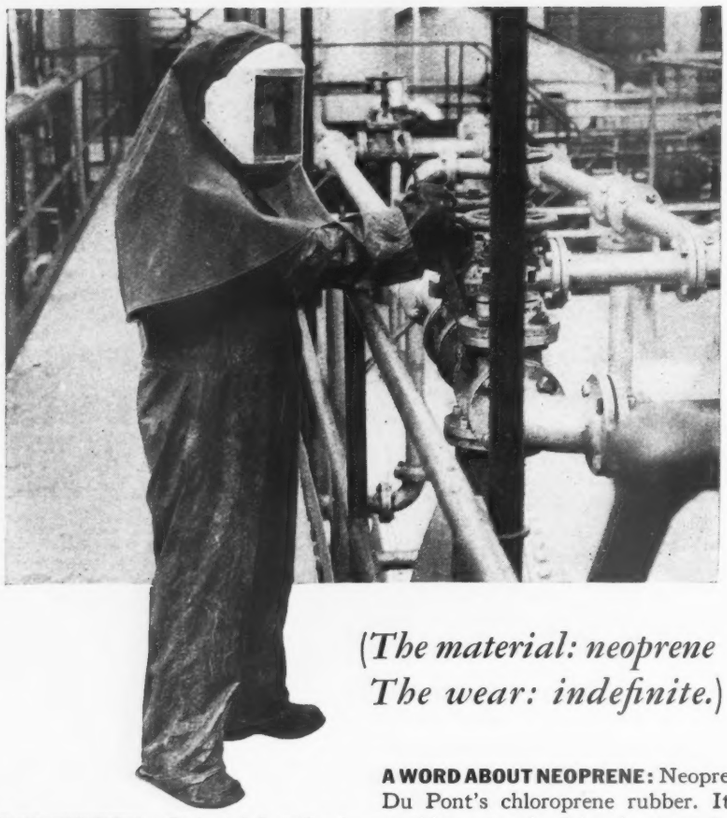
PURE THREE POINT LUBRICATION
A Complete Line of Industrial Petroleum Lubricants

THREE PURE

Ask a Pure Oil Engineer to help solve your lubrication problems

CHICAGO U.S.A.

HOW TO DRESS FOR A DATE
with sulfuric acid



(The material: neoprene
The wear: indefinite.)

HOW IT STARTED: Industrial tailors' bills were getting entirely too high to please a leading manufacturer of sulfuric acid. (Men who make corrosive acids, you see, need special protective clothing.) Rubberized work clothes were weakened by the acid and had to be discarded after only four to six weeks' use. But what better material was there?

WHAT THEY FOUND: An alert industrial clothing manufacturer soon answered that question. He made an acid-resistant outfit of stout cloth impregnated with Du Pont neoprene. And how it stood up! It lasted through six months of daily use . . . then someone took it home with him, so its ultimate life was never determined. Needless to say, this type of garment is now standard in that plant.

A WORD ABOUT NEOPRENE: Neoprene is Du Pont's chloroprene rubber. It resembles natural rubber in strength, resilience and toughness . . . but it is far less affected by corrosive acids and gases, oils, gasoline, heat, and sunlight. That's why more and more manufacturers are supplying their workmen with neoprene-impregnated clothing . . . an economy tip for you, too.

A SUGGESTION: Try neoprene-impregnated protective clothing in your plant. See how much longer it lasts and how much money it saves. Moreover, it's likely that you can use neoprene profitably in many other places in your plant . . . in belting, in cable, in packings, etc. To keep abreast of new developments in this remarkable material, write for your free subscription to the newsy, monthly Neoprene Notebook.

DU PONT REG. U.S. PAT. OFF. **NEOPRENE**

E. I. DU PONT DE NEMOURS & CO., INC.
RUBBER CHEMICALS DIVISION, WILMINGTON, DELAWARE

At Your Service

—for bringing business needs or "opportunities" to the attention of men associated in executive, management, sales and responsible technical, engineering and operating capacities with the industries served by McGraw-Hill publications:

The SEARCHLIGHT SECTIONS

(Classified Advertising)

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Bus Transportation
Chemical and Metallurgical Engineering
Coal Age
Construction Methods and Equipment
Electrical Merchandising
Electrical World
Electronics
Engineering News-Record
Engineering and Mining Journal
E. & M. J. Markets
Factory Management and Maintenance
Food Industries
Power
Product Engineering
Radio and Television Retailing
Textile World
Transit Journal

●

For rates or other information address the

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McGRAW-HILL PUBLICATIONS
330 W. 42ND STREET
New York, N. Y.

SEARCHLIGHT SECTION

EMPLOYMENT : BUSINESS : OPPORTUNITIES : EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

15 cents a word, minimum $3.00 an insertion.

(See ¶ on Box Numbers)

Positions wanted (full or part-time salaried employment only), ½ the above rates.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞ inch vertically on one column. 3 columns—30 inches—to a page. F.M.M.

Copy for new advertisements must be received by May 17th for the June issue

—TRANSFORMERS—

A Complete Stock **Prompt Shipment**

3—1000 KVA Gen. Electric Transformers, 60 cycle, 2300-230/460 volts **$1400.00** Each

We Rewind, Repair and Redesign all Makes and Sizes

ALL TRANSFORMERS GUARANTEED FOR ONE YEAR

Write for Catalog No. 134-D

THE ELECTRIC SERVICE CO., INC.

"AMERICA'S USED TRANSFORMER CLEARING HOUSE"

STATION M Since 1912 **CINCINNATI, OHIO**

POSITIONS VACANT

ENGINEER to operate power plant for manufacturing industry, 1800 boiler horse power, 1200 kilowatt load. Also maintain electric motors, plant wiring system, sprinkler system and water system. State salary desired. P-559, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago, Ill.

INDUSTRIAL ENGINEER. By national organization. Three years minimum experience in Bedaux time study methods. Permanent position. Furnish complete information on age, education, detailed experience, salary expected, small photo if possible. Do not apply without above qualifications. P-560, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago, Ill.

MICRO-MOTION STUDY ENGINEER—Industrial engineer thoroughly experienced on all phases of micro-motion study for permanent position with national organization. Not over 35. State age, education, complete details of past experience and salary requirements. Include photo if possible. P-562, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago, Ill.

EMPLOYMENT SERVICE

EXECUTIVES AND TECHNICAL MEN. Contact employees for positions through our confidential and effective methods. We negotiate preliminary overtures. Established 24 years. Inquiries invited. H. R. Harrison, Director. The National Business Bourse, 20 West Jackson Blvd., Chicago.

PLANT ENGINEER 39, have been in complete charge of maintenance, construction, plant layout and design, power plant, tool room, budgeting, taxation and personnel work. 18 years experience. Salary open. Go anywhere. PW-538, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago, Ill.

MR. PRESIDENT. Are you satisfied with the profits on your manufacturing business? You can secure the services of a high grade executive with 25 years experience with nationally known concerns in all phases of development and manufacture of mechanical products of outstanding quality. PW-561, Factory Management & Maintenance, 330 W. 42nd St., New York, N. Y.

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—the Searchlight Section is at your service for bringing business needs or "opportunities" to the attention of men associated in executive, management, sales and responsible technical, engineering and operating capacities with the industries served by the following McGraw-Hill publications:

The SEARCHLIGHT SECTIONS

(Classified Advertising)

American Machinist
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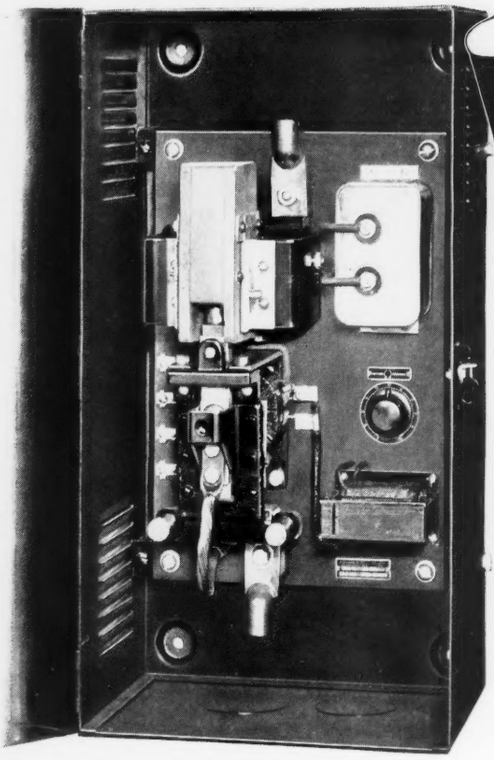

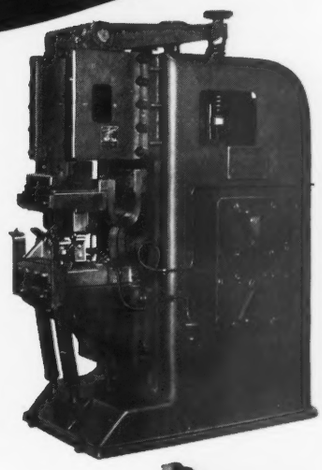

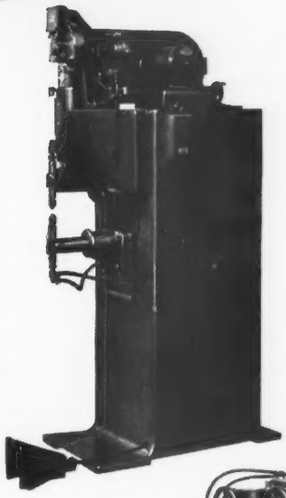

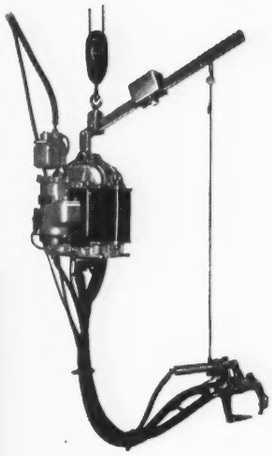

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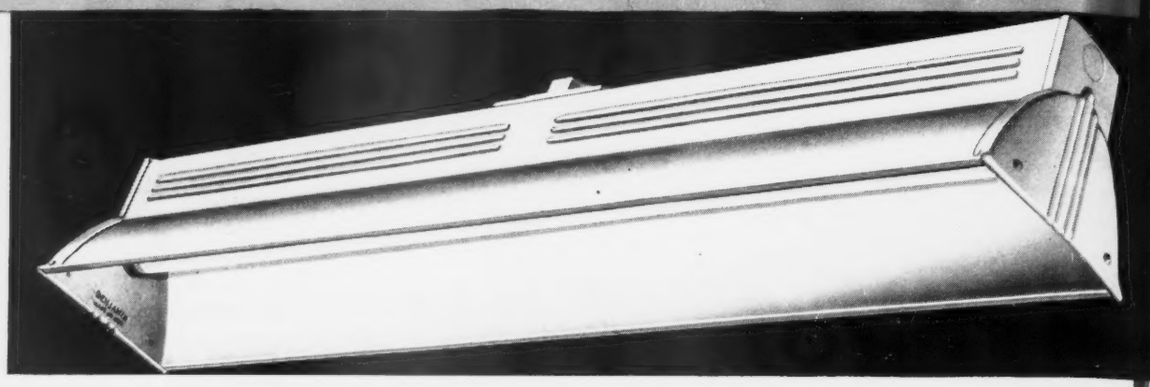

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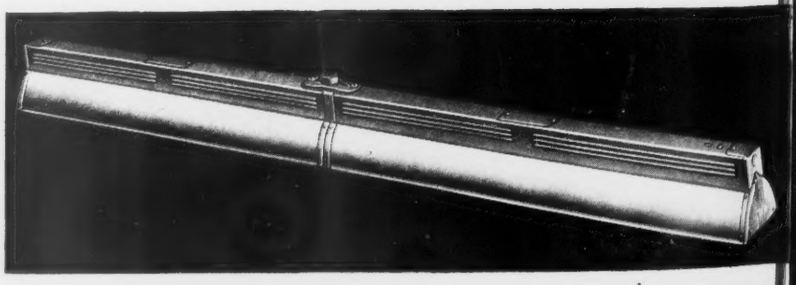

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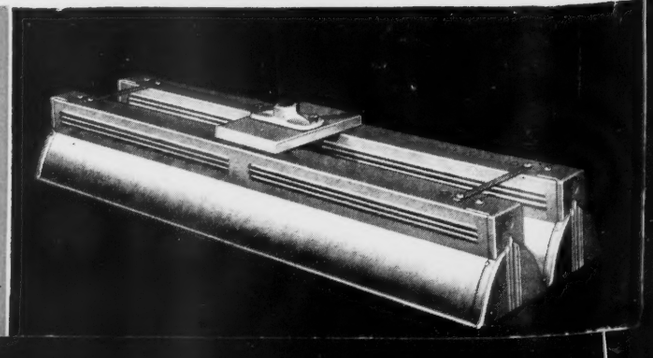
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